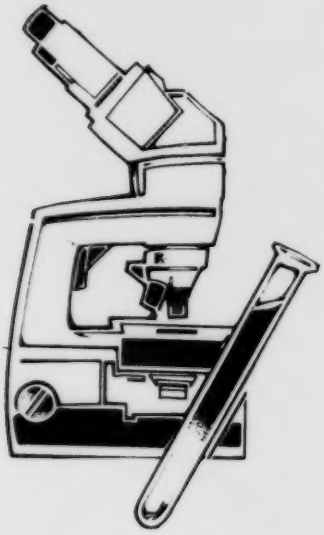
Laboratory Services in Saskatchewan



A Report to the
Minister of Health

October, 1985

The Honourable Graham Taylor
Minister of Health
Legislative Building
Regina, Saskatchewan

Dear Mr. Taylor:

It is our pleasure to submit to you the report of the Laboratory Services Review.

The report reflects many of the ideas and suggestions presented to us during the Review by individuals and organizations. A number of new directions are proposed for Saskatchewan's clinical laboratory services which, we believe, will lead to a more effective system for both users and providers of the services.

We wish to express our sincere appreciation to the many people throughout the province who openly submitted their contributions, both in writing and in meetings, and to those who spent many hours in the preparation of data and other information. Special thanks must be expressed to Dr. Hugh Robertson, Director of the Provincial Laboratory. We owe him a great debt for his guidance, objective advice, and dedication to the field of laboratory medicine in Saskatchewan.

Respectfully submitted,

F. J. Lone M.D.

Frank J. Lone
M.D., F.R.C.P (C).

David D. Warren
Saskatchewan Health

CONTENTS

PAGE

SUMMARY OF THE REPORT 1

INTRODUCTION

1. Terms of Reference 6
2. Scope of the Task 7
3. The Review Process 7

THE FIELD OF LABORATORY MEDICINE

1. The Lab Test 10
2. Quality Assurance 12
   - 2.1 Internal Quality Control
   - 2.2 External Quality Assurance
3. The Measurement of Laboratory Performance 14
4. Objectives of the Practice of Laboratory Medicine 17
5. The Regulatory Structure in Saskatchewan 18

THE GROWTH OF DIAGNOSTIC LABORATORY TESTING IN SASKATCHEWAN

1. Introduction 20
2. The Growth of Laboratory Testing 22
   - 2.1 Hematology
   - 2.2 Biochemistry
   - 2.3 Microbiology
3. Outpatient and Inpatient Testing 29
4. Summary and Conclusions 30

THE UTILIZATION OF LABORATORY FACILITIES

1. Causes of Growth in Utilization 31
   - 1.1 Physicians
   - 1.2 Hospitals
   - 1.3 The Authorities and Preventative Medicine
   - 1.4 Laboratories
2. Laboratory Utilization in Saskatchewan 33

REFERRAL PATTERNS IN SASKATCHEWAN

1. Introduction 36
2. Hematology and Surgicals 36
3. Biochemistry 37
4. Microbiology 38
5. Other referrals 39

ROLES OF THE LABORATORY SECTORS IN SASKATCHEWAN — PAGE

1. Hospitals 41
   - 1.1 Base Hospitals
   - 1.2 Regional and Large Community Hospitals
   - 1.3 ADC 25-50
   - 1.4 ADC 0-25
   - 1.5 Findings
     - Staffing
     - Supervision
     - Safety
     - Equipment and Supplies
     - Quality Control
     - Range of On-Site Tests
     - Service to Outpatients
     - Referred-Out Tests
     - Regional Service Departments

2. The Provincial Laboratory 51
3. Other Centralized Referral Laboratories 52
4. Private Laboratories 52
   - 4.1 Overview
   - 4.2 Pathologist-Supervised Laboratories
   - 4.3 Physicians Office Laboratories

5. Satellite Laboratories and "Specimen Collection Centres" 59

COSTS

1. Total Costs in 1983/84 61
2. The Growth of Laboratory Costs 62
   - 2.1 Hospital Laboratories
   - 2.2 The Provincial Laboratory
   - 2.3 Pathologist-Supervised Laboratories
   - 2.4 Physicians' Office Laboratories
3. Cost Comparisons 65

RECOMMENDATIONS

Introduction 68
Quality Assurance 68
Standards 72
Licensing 72
Decentralization of Referral Laboratories 74
Hospital Outpatient Services 79
Private Laboratory Remuneration 80
Utilization 81
Laboratory Manpower 84

APPENDICES **PAGE**

A Representation at the Introductory General Meeting, January 31, 1985, College of Medicine 89

B Hospital Questionnaire 91

C Hospital Questionnaire Respondents 105

D Literature Review - Selected Articles 107

E Authors of Briefs Submitted to the Laboratory Services Review .. 111

F Hospitals Visited 113

G (1) Performance of Hematology Tests 115
(2) Performance of Biochemistry Tests 116
(3) Performance of Microbiology Procedures in Hospitals 117
(4) Private Laboratories in Saskatchewan - Summary of Services and Payments 118
(5) Hospitals: Tests Requested on Specimens Referred-Out 119

H (1) Estimated Total Cost of Laboratory Services in All Saskatchewan General Hospitals 123
(2) Comparisons of the Growth in Laboratory Costs With Other Health Services 126

I Run-Off Costs for R.G.H. SMAC 127

J Saskatchewan Quality Assurance Services: Proposal 129

K (1) Specimen Transportation Options in the Prince Albert Region 133
(2) Specimen Transportation Options in the Swift Current Region 135
(3) Map: Approximate Hospital-Based Referral Laboratory "Regions" 137

SASKATCHEWAN LABORATORY SERVICES REVIEW

SUMMARY OF THE REPORT

This precis attempts to consolidate the main conclusions and recommendations in the report, but it obviously omits most of the background analysis and findings which support them. It is important to note that several specific recommendations are not addressed in this summary.

PURPOSE OF THE REVIEW

The terms of reference of the Laboratory Services Review called for a comprehensive examination of Saskatchewan's diagnostic laboratory system, proposals to enhance its cost-effectiveness, and recommendations for a policy framework for the system's future development. Emphasis was placed on the appropriate "roles" of the four major laboratory "sectors".

The Minister of Health announced the commencement of the Review in late January, 1985.

METHODOLOGY

The Review process encouraged as much input as possible from the providers and users of laboratory services. Briefs were received from 27 organizations and individuals, and meetings were held with most of the authors. Questionnaires were returned by 98 hospitals, and on-site visits were made to 30 of them across the province. Four private laboratories were visited. Several laboratory professionals prepared material on specific subjects upon request. A literature search and considerable statistical analysis were also undertaken.

The Review focused on the three main sections of laboratory testing - hematology, biochemistry and microbiology. Pathology services, such as histology, were not examined in detail. Other diagnostic services, such as radiology and ECG, were not part of the Review. The time frame covered was 1978/79 to 1983/84.

OVERVIEW OF THE LABORATORY SYSTEM

The services under study included 518 laboratories in fiscal year 1983/84. They are grouped below into four sectors, together with their Provincial funding agencies:

5	Pathologist - Supervised Private Laboratories (plus "satellite labs" and "specimen collection centres")	Medical Care Insurance Commission (MCIC)

379	Physicians' Office Laboratories	MCIC
133	Hospital Laboratories	Saskatchewan Hospital Services Plan (SHSP)
1	Provincial Laboratory	Saskatchewan Health

FINDINGS

Volumes and Utilization

The number of tests performed in Saskatchewan increased by approximately 23 percent between 1978 and 1983/84. The growth over the period in each sector is shown below. Percentages for the public sectors are approximations:

Physicians' Office Labs	42%
Pathologist-Supervised Labs	29%
Provincial Laboratory	17%
Hospital Laboratories	13%

The increase in volume is attributable to several factors. Volume increases in Regina and Saskatoon correspond closely to the increase in the number of physicians. Their average utilization of laboratory services has slightly decreased. Rural physicians, while currently ordering fewer tests each than urban doctors, increased their requisitions an average of 25 percent over five years.

For the province as a whole, we estimate the number of tests ordered per physician per 1,000 beneficiaries increased by 4.4 percent in biochemistry, and decreased by 1.3 percent in hematology. In conclusion, the major factors contributing to the growth of testing have been the growth in the number of urban physicians, the growth of the urban populations, and increased utilization by rural physicians.

COSTS

The total costs of laboratory testing grew faster than other medical services over the five-year period, especially in the privately-owned laboratories.

Cost increases in the hospital and pathologist-supervised laboratories, which together perform about three-quarters of all testing, appear to result from a combination of increases in volume, salaries and supply costs. The costs of physicians' office laboratories grew considerably more - the rise in the average cost per service exceeded cost factors. This appears to reflect a shift towards the provision of higher cost tests in the fee schedule. The Provincial Laboratory's costs grew less than any other sector.

Outpatient and Referral Services

Routine outpatient testing has grown much greater than inpatient work (throughout the report "outpatient" means all patients other than "inpatients"). Increasingly it is the major laboratory service provided by most hospitals under 50 A.D.C. It is a significant proportion of the work in large community and Regional hospitals, as well. Much of the growth of outpatient testing in Base hospitals, however, appears to be due to special outpatient clinics as opposed to routine work.

Many physicians, especially those in cities with Regional and Base hospitals, considered the laboratory outpatient departments inconvenient to patients, and felt most provided fairly poor service. A major complaint was that most hospital laboratories close to outpatients several hours before the doctors' offices. This has been a major inducement for physicians to utilize private laboratories, where available, or to establish their own office laboratories.

Pathologist-supervised private laboratories are not available to rural physicians. They have directed most of their patients to the local hospitals, which in turn refer a high proportion of requisitioned tests to the Provincial Laboratory in Regina.

The Provincial Laboratory was criticized by physicians and hospital staff primarily for the lengthy turnaround times on many tests - mainly in the areas of microbiology, R.I.A., electrolytes and cardiac enzymes. Complaints increased with distance towards the north and northwest of the province, adding support to the belief that the postal system is the major problem with turnaround times. Another problem is the batching of some tests at the Laboratory, which is a good economy measure but can contribute appreciably to delays. The reliability of the Provincial Laboratory's microbiology results was often questioned by physicians. Lengthy transit times in uncontrolled environmental conditions is the most common reason cited for the problem.

It should be noted that the Provincial Laboratory received numerous compliments as well as critical comments.

Other Problems in the System

A number of other shortcomings in the laboratory system were brought to the attention of the reviewers. None of these deficiencies necessarily pose a threat to the users or providers of the service, or the the public, but there are several opportunities for improving the effectiveness of the system and everyone's confidence in it.

The lack of a compulsory quality assurance program was universally regarded as a major deficiency in Saskatchewan's laboratory system. A closely related area - standards for equipment, staffing, safety, etc. - was noted as another problem.

Most professionals in the field of laboratory medicine believe the system is "laissez-faire" to a fault. As a result, services are too uneven across the province, and forward planning is compromised by the lack of role definitions and policy quidelines for the system's development.

RECOMMENDATIONS

The major recommendations in the report are condensed below into three proposed policy "frameworks".

A Regulatory Framework

The reviewers propose that a regulatory structure is necessary to the development of an effective laboratory system in the province. A framework is required to give form and direction to the system.

Quality is fundamental to effectiveness. A compulsory external quality assurance program is required for all the province's laboratories, for internal procedures alone are not adequate. The program should come under the auspices of the College of Physicians and Surgeons of Saskatchewan. We recommend that a staff unit of the Provincial Laboratory provide the day-to-day administrative support to the program.

Standards should be developed for all diagnostic laboratories.

A licensing process should be enacted. Licenses would be issued to all laboratories for each test on the basis of public need by a Standing Committee of Saskatchewan Health, subject to certification of competence by the College. The Standing Committee should provide direction and coordination to the system. Administrative support for the licensing process, which should include the enforcement of standards, should be the responsibility of a unit of the Provincial Laboratory.

A New Referral Framework

There are signs that routine biochemistry and microbiology testing will be performed more and more by rural hospitals and physicians' office laboratories. Provision should be made for a more orderly "decentralization", and a higher level of service, than the current random process allows.

It is proposed that the Provincial Laboratory's role as a routine referral centre be assumed by the pathologist-supervised laboratories of about ten Regional and Base hospitals. In addition to better turnaround and quality, the smaller centres should receive various services from the "regional" pathologists and senior technologists. The additional resources that would need to be provided to the "regional referral laboratories" should, in turn, allow them to improve the scope of their services to patients in their areas.

The University Hospital should expand its role as a provincial referral centre for the northern "half" of the province while the Provincial Laboratory should continue to serve the south.

It is proposed that the administration and coordination of many aspects of the "Regulatory Framework" would be implemented through the regional structure. In addition, to ensure consistency throughout the province, the "regional referral laboratories" should be tied closely to the Provincial Laboratory.

Roles of the Laboratory Sectors

The following are highlights of a proposed framework for the roles of each "sector" in Saskatchewan's laboratory system.

It is reasonable that physicians provide a limited number of tests in their offices for the immediate management of their patients. Laboratories should not be operated as adjunct businesses within their offices, however, and should receive fees which do not include provision for "return on investment" or overheads.

Pathologist-supervised laboratories are a necessary part of the health-care system in Saskatoon and Regina. They "compete" with other laboratories for routine outpatient work by providing more convenient or better service. In our opinion, however, the hospitals outside the two largest cities require all the routine work available to permit them to maintain and enhance medical services and to capture economies of scale. They should not be "protected" from private competition if they are unwilling to provide appropriate levels of service, however.

The role of the pathologist in the private laboratory should be clarified by splitting the professional and technical components of the fee. The private laboratory should operate on a more equal basis with hospital laboratories in providing services to the outpatient "market". To this end, the fees for tests which benefit from economies of scale should decline with volume.

Hospital laboratories should demonstrate a greater commitment to the service of the general public by improving their services to outpatients. They should establish facilities like specimen collection centres (and be publicly funded for them) where they are cost-effective. All hospital laboratories should be required to serve outpatients during hours coincident with physicians' office hours.

The Provincial Laboratory should cease to provide routine tests over an appropriate period, and establish a number of new roles. These should include the administrative aspects of the regulatory framework, the evaluation of new tests and procedures, and educational and coordinative function in relation to the regional framework, and an enhanced Public Health role. Its function as a provincial referral centre should continue for the more esoteric tests, though at a reduced volume. In this regard, it should establish closer ties and cooperative arrangements with the University Hospital.

INTRODUCTION

1. TERMS OF REFERENCE

The Hon. Graham Taylor, Minister of Health, announced the commencement of the Laboratory Services Review in January, 1985. The terms of reference for the Review are reproduced below:

BACKGROUND

Diagnostic laboratory services in Saskatchewan are provided by the Provincial Laboratories in Regina, hospital-based laboratories, physicians' office laboratories and privately-owned laboratories. Public expenditure on these services exceeded $50 million in 1983/84.

Following the trends throughout North America, the use and costs of laboratory services in Saskatchewan are growing rapidly. Advanced instrumentation, for example, has made greater volumes of traditional diagnostic tests, as well as new procedures, technically feasible but not necessarily more economical or essential.

Few guidelines currently exist for the delivery and growth of the laboratory system to aid the providers of services in their operations and planning, and to ensure effective service to the public of Saskatchewan.

SCOPE OF WORK

Under the auspices of the Minister of Health, the reviewers shall:

1. Examine the present system for the delivery of diagnostic laboratory tests and procedures in Saskatchewan from the point of view of adequacy, quality, cost, efficiency and the role of the providers and users of the system.

2. Consult with, and receive briefs from, any interested group, association or individual.

3. Recommend changes that may be needed in the diagnostic laboratory system to:

   (a) allow the best combination of quality patient care and efficient public expenditure, and

   (b) provide a workable framework for the future growth and delivery of laboratory services in Saskatchewan.

REVIEWERS

Dr. Frank Lone, Pathologist, Thunder Bay, Ontario
Mr. David Warren, Saskatchewan Health, Regina, Saskatchewan

TIMING AND REPORTING

The reviewers shall submit a written report of their findings and recommendations to the Minister of Health by August 31, 1985.

2. SCOPE OF THE TASK

As stated in the terms of reference, the reviewers limited their examination to the four largest sectors providing clinical diagnostic laboratory services in the province: the public general hospitals, the Provincial laboratory; the privately-owned, pathologist-supervised laboratories; and, the laboratories operated by physicians in their offices. A number of specialized laboratories were not covered in the review, such as those operated by the Royal Canadian Mounted Police, community clinics, and rehabilitation hospitals.

Diagnostic services not pertinent to the clinical laboratory, such as radiology, ultrasound and E.C.G. were not part of the terms of reference.

The task was viewed primarily as a policy and planning process. Although operational matters needed to be examined in this context, the reviewers attempted to limit their observations and recommendations to matters of relevance to the laboratory system as a whole.

Thus, we have not examined in detail a number of the concerns that were raised during the review process. Some of these include: hospital budgeting, pathologist salaries, rationalization of laboratories within cities, and the situations of specific individuals or institutions (with the exception of the Provincial Laboratory). Given the scope of the task, the reviewers felt that such matters were not within their mandate or competence.

Finally, although the time frame allowed for the Review permitted a thorough examination of the system, and the compilation of original data and ideas, as a "framework" document the report will not answer all the detailed questions people may have.

3. THE REVIEW PROCESS

The review process was designed to encourage the broadest possible input from both the users and providers of laboratory services.

At the invitation of the Minister of Health, representatives of organizations most directly involved in laboratory services met at the College of Medicine, University of Saskatchewan, on January 31, 1985. (See Appendix A). The reviewers addressed the terms of reference, and each organization and their individual members were encouraged to submit a Brief. The Review process was outlined. Some valuable suggestions and points of clarification were made by those attending.

Very little information was available about the activities of the largest laboratory sector - the hospitals. A questionnaire was sent to each public general hospital in the province to obtain, first, the subjective judgment of administrators, medical staff, and laboratory directors about their own hospitals' services and the referral laboratories on which they depend. The second part of the questionnaire requested information about staff, space, equipment, and the scope of testing on-site.

Questionnaires were returned from 98 hospitals, a response rate of 74%. Of the hospitals above the 20 "approved daily census" size, only three did not reply. The questionnaire is reproduced as Appendix B, together with a list of the hospitals which responded.

An extensive literature search was carried out with the help of Dr. Robertson and the Library of Saskatchewan Health. With the rapid expansion of medical technology there has been a concomitant flood of journal articles dealing with all aspects of laboratory medicine. The results were very useful, particularly in the areas of utlization, quality and costs. A selected list of the articles is Appendix C.

A total of twenty-seven Briefs were submitted to the Review. Fourteen were prepared by organizations, and the remainder came from individuals. Many of the Briefs were very comprehensive and broad in their outlook, and were indispensable in the Review. A list of the individuals and organizations who submitted Briefs is appended.

The reviewers believed it was important to obtain information about the laboratory systems in other provinces as a basis for comparison and as a source of ideas. We spent one day in each of Toronto, Winnipeg, Edmonton and Victoria, in meetings with senior officials in the respective provincial health departments. In Manitoba, a meeting was also held with a representative of the College of Physicians and Surgeons. All of the individuals we met with were experts in the laboratory field in their provinces; they provided a great deal of knowledge and insight. It is interesting to note that while laboratories in all five provinces serve the same functions, their structural organization, funding mechanisms, and regulatory approaches are very different.

The most important parts of the Review process were the discussions held with the individuals who submitted Briefs, and on-site visits to a sample of hospitals.

Meetings were held with over two dozen groups and individuals, usually with their Briefs as the focal points for discussion. The reviewers used these opportunities as forums in which to seek reactions to ideas, usually those proposed by others. Through such means we found many areas of agreement. In fact, most of the recommendations of this report have been discussed with a large number of the users and providers of laboratory services. While there is by no means a consensus in the field, we do believe the differences of opinion are not as marked as previously believed.

Similarly, practitioners in the hospital setting were part of this consultative process. Thirty hospitals were visited, including some which did not respond to the questionnaire. An attempt was made to meet with as many people as possible in each hospital, and in several this included board members, administrators, most of the medical staff, the pathologists, the senior laboratory technologists, and directors of nursing. Each visit included a tour of the laboratory, and most involved discussions with the technologists and technicians at the bench. The hospitals visited are listed as Appendix E.

On-site visits were also made to the following private laboratories:

Independent Medical Laboratories (Regina)
P.A. Medical Laboratories, Inc. (Prince Albert)
Regina Diagnostic Laboratory (Regina)
Medical Arts Laboratory (Saskatoon)

Again, the discussions were open and frank, and very informative.

Finally, three individuals were kind enough to provide, at the Reviewers request, additional information. Mr. Fred Bahr, of the Victoria Union Hospital, and Mr. Gerry Dempsey, with Swift Current Union Hospital, undertook research on the alternative modes of transportation of specimens in their regions. Dr. Stephen Harold, as President of the Sask. Society of Clinical Chemists, prepared a "Proposal for a Saskatchewan Quality Assurance Service". Their reports were extremely helpful in the Review and are reproduced, with their permission, in Appendix K.

THE FIELD OF LABORATORY MEDICINE

Many of those reading this report are not as conversant as others in the field of laboratory medicine. It is also our impression that many involved in the subject, whether directly or indirectly, have different perceptions of the field and how laboratory medicine is practiced in different parts of Saskatchewan.

We also believe that the recommendations in this report will be better understood if we attempt to articulate the kinds of objectives we are trying to achieve.

Thus, while this chapter may appear to be rather elementary to some, it is important that any reader be aware of the writers' assumptions, prejudices, and principles as a context for what follows.

1. THE LAB TEST

A specimen is obtained from the patient and it is examined. The specimens may be blood, urine, feces, tissue, body fluids (such as chest, joint, abdominal,brain and/or spinal canal), fingernails, hair, sputum, discharges, etc. The examination or test that is carried out is dependent upon the type of specimen and the information required.

This "laboratory test" is a measurement or an interpretation of one or more components in a patient's specimen. This is done to aid the physician reach a diagnosis, or to monitor the patient's treatment or to follow the patient's progress over a long term. In most instances all three reasons apply. The "laboratory test" is requested at the appropriate time by the attending physician. The examination is done in the laboratory by suitably trained technologists, usually under the guidance and supervision of a pathologist.

The laboratory consists of many separate, distinct and unrelated sections. The common thread that binds all the sections is that the patient provides the specimen.

The section of HISTOLOGY examines tissues, either biopsies, parts of organs, or entire organs. After processing, the pathologist, utilizing special stains and a microscope, will provide a consultation report. This will identify the disease (e.g. cancer). In Saskatchewan this is a satisfactory service with no apparent problems. The reviewers have no need to make any further comments.

The section of CYTOLOGY is related to histology in that this is an interpretation of cells rather than tissue (e.g. Pap smears).

The section of HEMATOLOGY examines the cellular components of the blood as well as the clotting mechanisms. There is equipment that readily count

red cells, white cells and platelets. Smears are made; clotting aberrations are identified (e.g. hemophilia). Tests are used to monitor anti-coagulant therapy.

The section of BLOOD BANKING obtains blood from donors either directly or from the Canadian Red Cross Depot. Each unit is cross-matched with the donor/recipient. Errors can lead to death or severe life threatening complications.

The section of CLINICAL BIOCHEMISTRY measures biochemical components in patient specimens. It identifies and provides concentration levels. Present technology provides equipment that can perform one or more measurements simultaneously and accurately. This section generates the greatest work volume and expense.

As part of biochemistry, there are tests that require the use of radio-isotopes. These are referred to as R.I.A. procedures (radio-immuno-assay)(e.g. T3 or T4).

The section of MICROBIOLOGY identifies living micro organisms (bacteria, viruses) in the patient's specimen. To make this identification the specimen must contain living micro-organisms. Unfortunately the organisms die very easily if exposed to drying, heat or cold. Thus transportation of any distance in unprotected containers (e.g. the mail), can result in an unacceptable high rate of death, particularly the summer heat and the winter cold. Infections are one of the leading causes of illness and hospital admissions. Thus, this laboratory section is very important.

The section of IMMUNOLOGY is found only in very large laboratories. It requires very special expertise along with adequate work-loads. Some of the tests identify special infections (e.g. hepatitis), others identify disease states (e.g. anti nuclear factor for lupus), and others help in diagnosing special arthritic diseases. This section would also measure organ compatibility (e.g. for kidney transplants).

There are other miscellaneous tasks that are performed without an actual designated section (unless volumes warrant this). The laboratory identifies parasites in specimens. This is becoming more important now that world travel is easy along with the influx of new citizens, particularly from the third world (e.g. malaria). This type of examination is referred to as PARASITOLOGY.

The industrial work place processes or uses chemicals that may affect the workers. These must be identified (e.g. lead, mercury, etc.)

Then there are the patients with drug overdoses, self-induced or otherwise, which require identification and concentration (e.g. alcohol, valium, heroin, LSD, etc.). These types of examinations are referred to as TOXICOLOGY.

In summary the laboratory conducts examinations in: histology, cytology, hematology, blood banking, biochemistry, microbiology, immunology, parasitology, toxicology. Only the very large laboratory would perform all of the above functions.

2. QUALITY ASSURANCE

The laboratory identifies as well as measures a multitude of components in biological material obtained from patients. It is incumbent on the laboratory to provide accurate data since in many instances decisions with far reaching implications to patients are based on these reports. The laboratory must undertake a complex quality assurance program to achieve this accuracy.

There are both internal and external aspects to this program.

2.1 Internal Quality Control

Internally, the quality assurance program attempts to monitor as many of the aspects that may affect accuracy as it can. The following briefly identifies some of the major areas.

Each test must be performed in the same manner; the method should be outlined in detail. All these tests should be included in a METHODOLOGY MANUAL (which are readily available). Unauthorized deviations should not occur. The larger laboratories would have such manuals in the various sections.

Instruments and equipment that are improperly maintained will not give good performance. Manufacturers' recommended maintenance schedules should be followed carefully. To achieve this MAINTENANCE MANUALS should be readily available, along with records indicating the necessary work and with documentation of completion. Proper maintenance will reduce the incidence of instrument failures and may obviate unnecessary expensive repairs.

Temperatures of refrigerators, water baths, incubators, autoclaves, and hot air ovens must be checked routinely and documented.

Chemicals, sera, radioisotopes, stock and working solutions that may have limited shelf life should be identified and the expiratory dates prominently displayed on each container. Expired material should never be used. All perishable materials should be properly stored.

Safety in the work place must be assured to protect the technologists and others in the institution. There should be a detailed SAFETY MANUAL that covers all areas, how to cope with accidental spills of chemicals or biological fluids, and accidental cuts or needle pricks. Since the laboratory handles many highly infectious specimens, food and smoking should not be allowed because of the dangers of ingesting infected

material. All technologists working with biological material should protect their clothing with a laboratory coat. These should never be worn outside of the laboratory, particularly to the dining area. Infectious material should, if at all possible, be handled within a fume hood. If this is not available great care should be exercised (such as wearing of rubber gloves or face masks). There should be a written policy on the handling of waste products. At no time should such waste products be a hazard to other hospital workers, such as housekeeping staff.

Assured that the instruments are properly maintained, glassware is clean, and chemicals have their stated potency, the technologist will calibrate the instrument. This may take but a moment, but in some instances may take considerable time.

In a very simplistic manner, the following paragraph outlines the procedure that is followed in testing a patient's specimen.

The physician requests one specific test on the patient. The correct methodology is selected. The unknown (the patient's specimen), an abnormally high standard, an abnormally low standard, a certified known quality control, and a standard within normal range are all treated simultaneously. By treating all in the same way and at the same time, such variations as fluctuating electrical line current, ambient room temperature, slow electronic response in the instrument, etc. will cancel each other since their total effect is the same for all. These variables cannot be controlled by any other method. If more than one patient's specimen is examined, these can all be tested at one time using one set of standards and control. This is called "batching". Since standards and controls are expensive, batching lowers the unit cost. Results, if very abnormal, are often repeated. In instruments that are automated, two consecutive abnormal results are repeated to make certain that there was no carry-over from one to another. Where volumes are low, duplicates are often done to ensure reproducibility.

Data are collected each day on the standards and controls, and quality control charts are constructed identifying the levels of two Standard Deviations (+ or -). Graphs are constructed which will be used on a daily basis. This is done every month (a minimum of 28 - 30 determinations are necessary). Laboratories that have a low volume may take months before enough data is collected. These graphs are used as a guide each time the test is done. Should the control material show a level greater than two S.D., it means the test is out-of-control and must be repeated. Minor changes may appear which, to the knowledgeable, predict specific problems. Each laboratory establishes its normal range (using its own methodology and instruments). Unfortunately, with all the care that is taken as outlined, the final normal range may only reflect accurate reproducibility and not necessarily accuracy.

2.2 External Quality Assurance

This introduces the second part of quality assurance, namely external quality control.

A central body with a very large data base, for example, the College of American Pathology (CAP), supplies unknown specimens. The laboratory is required to determine the exact amount of a specified constituent. The laboratory is to treat this specimen as if it were a normal patient's blood utilizing their regular methodology. The laboratory's results are then compared with a large peer group who use the same equipment and the same methodology. This is the only way to truly measure accuracy and is the final test of a quality program.

In addition to the external quality control specimens, quality assurance encompasses much more.

Those laboratories which have difficulty achieving accuracy in one or more tests need help if they are to continue to function. This means an educational program must be in place.

At first it will be directed at problem areas with specific tests. These will need to be corrected.

Then the program expands to provide education to up-grade and add skills to the technologists.

This will allow them to correct and anticipate local problems before they become major ones.

Each hospital admits infectious diseased individuals. It has a responsibility to protect its staff and other patients from cross-infection. If microbiology is done in the laboratory, technologists can contribute greatly to the Hospital Infection Control Committee. This, too, can be part of the educational aspect.

3. THE MEASUREMENT OF LABORATORY PERFORMANCE

The terms of reference requests, in part, that the reviewers examine the "efficiency" of the diagnostic laboratory system. To some, this meant the calculation of the relative "cost per service" between laboratory sectors or individual laboratories. Like analysts before us, we found that while such measures are possible within a single laboratory, they cannot be used to compare entities within the system.

Diagnostic laboratories provide services. Their products are information, and their major input is highly skilled labour. Despite the apparent wealth of data generated by laboratories, measures like efficiency and productivity are no less difficult to determine than for areas like the legal profession or management consulting. Some of the general limitations to analysis include:

- different "quality" of services (perceived or real)
- different "mixes" of services between laboratories, especially in the hospital sector
- widely different facilities and equipment
- rapid technological change (today's least efficient producer could be tomorrows most efficient)
- the existence of "underutilized" but necessary equipment in some hospitals

Thus, even if calculations were possible to show that certain laboratories or sectors were the most "efficient", the results would be potentially unfair and probably relevant for only a short period of time. The following sections discuss the measurement problems in more detail.

Efficiency of the Private and Public Sectors

Private laboratories, which are remunerated on a fee-for-service basis, provide records of each test or service they perform. The cost to the paying agency, the MCIC, is the fee. The actual cost of performing the tests is unknown, however, because the private laboratories have the right to keep their records confidential. The analyst has output measures to work with, but no input measures.

Conversely, most public laboratories (i.e. hospitals, Provincial Laboratory) maintain records of most input costs, but do not record outputs (tests or services). While the major costs are available, they cannot be apportioned to specific tests. By asking the public laboratories to provide raw monthly data in the Hospital Questionnaire, we were able to derive a picture of relative activity on a test-by-test basis, but the other data limitations precluded cost-per-test calculations, and comparisons with the private fees.

The rapid introduction of semi-automated and automated equipment in laboratories has made the number of tests performed a misleading indicator of the resource inputs required in the public sectors. The laboratory "workload Unit" is now used in public laboratories as the main measure of inputs. Since private laboratories do not report records of their "workload Units", however, this measure cannot be used to compare performance between sectors, either.

Efficiency Within the Public Sectors

The laboratory workload "Unit" equals one productive minute of technical, clerical and aide time required in the performance of a laboratory procedure. Each test is assigned an average number of minutes, or Units. Test A may have a Unit Value of 3.0 and Test B may have a Unit Value of 6.5. The Units vary considerably with methodology and equipment. A Bilirubin performed manually receives 11.0 Units; as part of a Technicon SMAC profile it would get about one-twentieth of 2.5 Units.

Within a single laboratory, the Canadian Workload Measurement System is a valuable management tool. Unfortunately, it has become misused as a proxy for output. The cost per Unit is a meaningless ratio of inputs to inputs. In addition, the Unit Values generally fall much more than total costs with the introduction of more efficient equipment. Thus the more automated laboratories always show a higher cost per Unit than those using manual procedures.

In order to keep up with advancing technology and improved methods, the Unit Values are changed every few years. This makes intertemporal comparisons extremely difficult. Within the time frame of this Review, biochemistry Unit Values were reduced sharply.

Thus, there is no reasonable data base for the calculation of efficiencies or productivity within the public sectors.

Other Statistical Problems

The use of "profiling" equipment was a major problem in assessing demand or utilizations in the public sector. If a physician orders three tests and the laboratory performs them manually, the output is three results. If the laboratory uses a simultaneous analyzer with twelve channels, however, the output is twelve results. Since no public laboratory we spoke with records the actual number of tests requested, we had to count either twelve test results, one specimen, or the Unit Value per specimen.

The number of tests overstates the demand on the laboratory and the utilization by the physician. The number of specimens underestimates. The number of Units is not meaningful as a measure of demand or utilization.

It was decided to count each profile as the number of component tests, and thereby overstate demand, for a number of reasons:

- the data on private laboratories provides the actual number of tests requisitioned
- it is assumed the physician almost always orders two or more tests on a specimen, or the profiling machine would not have been used
- the Provincial Laboratory indicated that the majority of requisitions put through the SMAC called for complete profiles; this was supported by other laboratories using smaller equipment
- the number of tests is intuitively easier to understand - the physician orders tests, not specimens or Units.

We believe, therefore, that the number of tests overstates demand less than the number of specimens understates it. In percentage growth calculations, year-over-year, the use of tests or specimens should yield the same results (unless major changes in equipment were made over the period).

The time frame covered in this Report is relatively short - fiscal year 1978/79 (or 1978) to 1983/84. The five year span was determined as appropriate given the rapid, major changes in the laboratory field, and the need to seek raw data from the hospitals. At the time the hospital questionnaire was distributed, the last fiscal year available was 1983/84.

4. OBJECTIVES OF THE PRACTICE OF LABORATORY MEDICINE

The laboratory provides support to the physician in his approach to patient care.

The laboratory is used:

1. To confirm a clinical impression or establish a diagnosis.
2. To rule out or reject a diagnosis.
3. To indicate prognosis.
4. To assist in treatment & management of the patient.
5. To provide reassurance to the patient and indirectly to the doctor.
6. Very rarely, to screen, or to detect sub-clinical disease states.

This service provides the physician and, indirectly, the patient with a vital and necessary facet to aid in care.

Each physician should have equal access to the laboratory, limited to the nature of the practice. The physician must be convinced that the laboratory tests meet an acceptable standard of high level of competence. Each physician should expect to receive test results, in all branches of laboratory care, as quickly as possible. Results that are not clinically relevant should be regarded as academic or historical and of no value to either the physician or the patient. Each physician should be able to benefit from the consultative services provided by the laboratory and be able to choose the consultant when necessary.

In turn, when patients are admitted to a hospital, they should not need to be transferred to another solely on the basis of availability of laboratory service. This means, in effect, that each hospital should have the laboratory services required to meet the needs of the patients who have been admitted for care.

Laboratory services should be located as close to the patient as possible. As noted previously many biological fluids do not travel well and tests may result in misleading information. Consultations will occur more frequently and have much more meaning if the laboratory is close to the physician. The turnaround time for results to reach the physician will be markedly improved as distances are minimized.

All laboratorians should strive to be efficient with the human, physical and financial resources at their disposal. To contribute to the practice of good medicine, however, they and the system within which they work must be EFFECTIVE.

An efficient system which costs very little, but - has unknown quality; is not timely; produces numbers but no intelligent judgement; does not provide the range of tests needed according to local circumstances; imposes costs or suffering in the users (patients) of the system - IS NOT EFFECTIVE.

At the same time, of course, we recognize that society could never afford standards of service which would leave nothing lacking in the above criteria.

5. THE REGULATORY STRUCTURE IN SASKATCHEWAN

The laboratory is equipped with elaborate and expensive equipment; it has a relatively large technical staff; and it occupies much space. It provides a wide variety of tests, and its work is an indispensable part of the health-care system.

It is unreasonable not to expect some clearly defined rules and regulations in this highly technical and critical area.

Yet, in Saskatchewan, there are no regulations which relate specifically to laboratories. At present there is an informal system that appears to function on the basis of vague arrangements or "understandings". This informal approach can, and does, lead to a number of "misunderstandings".

Other provinces have Acts and regulations that tend to give form and direction to the laboratory sector. In Ontario, all laboratories are licensed and each laboratory must be licensed for each test that is performed. A mechanism is in place to allow additions to the license. Others have regulations that define the training and experience of laboratory directors, supervisors, technologists, technicians. In Manitoba, private laboratories are not allowed to function outside Winnipeg and Brandon.

Some provinces attempt to regulate growth, and direct laboratory expansion into needed areas in order to provide more equitable service throughout their provinces.

In Alberta, as well as in Ontario, laboratories must have a pathologist as the director, or a medical doctor with demonstrable knowledge of laboratory medicine. Some provinces insist that the small laboratory have a liaison physician responsible to a consulting pathologist.

In all the provinces visited during the Review, it was noted that all laboratories must partake in compulsory quality assurance programs.

The reviewers do not believe in regulation for the sake of regulation. Most regulations bear a cost and the costs can exceed the benefits. Often regulations attempt to preserve the status quo, and thwart beneficial change. Some regulations benefit the regulated much more than society as a whole.

During the Review process there was a clear consensus, however, that regulations were necessary in the laboratory field. Very few of the suggestions that came forward were self-serving. Rather, they expressed a desire for order in the system. This included the establishment of standards, a basis for planning future activities, a more rationale pattern of on-site and referral testing, and the establishment of roles and responsibilities.

THE GROWTH OF DIAGNOSTIC LABORATORY TESTING

1. INTRODUCTION

The purpose of this part of the report is to provide an overview of the total amount of testing that has been performed in Saskatchewan in recent years. More detailed analysis follows in later sections.

As noted earlier, the statistics maintained by the hospital sector and the Provincial Laboratory conform to the Statistics Canada "Unit" system. The number of "tests" used in this Report has been obtained from the Hospital Questionnaire. The definitions of "tests", etc. are reproduced in Appendix B. The most important thing to note in the counting of "tests" is our treatment of the profile or panel. In order to see just how many tests were ordered/produced, each profile was counted as the number of tests produced within the profile. Thus one specimen on an SMA 12 counted as 12 tests. The recipients of the questionnaire were asked to supply the number of tests performed in the month of November for the years 1979 to 1984, inclusive. November was chosen as an "average" month for workload in hospital laboratories, which would be useful for comparative purposes; choosing a single month saved laboratory personnel a lot of work in assembling raw data for complete years. Unless necessary, the reviewers have not used the November figures to represent annual totals by multiplying by twelve.

Since many hospitals under an "approved daily census" of twenty did not respond to the questionnaire, the entire hospital population numbers were derived by extrapolating from those returns received. Since the response rate in any hospital size category was never less than 62 percent, we are confident in the accuracy of the estimates.

On many of the tables to follow, data will be credited to AR-1's as source. The AR-1 is the "Annual Return of Health Care Facilities - Hospitals: Part One", an extensive annual survey conducted by Statistics Canada.

In this part, and throughout the Report, only the standard sections hematology, biochemistry, and microbiology are examined. These sections represent virtually all of the workload in the various laboratory sectors, with the exceptions of the Regional and Base hospitals.

Statistics covering 518 diagnostic laboratories are used in this report for the fiscal year 1983/84.

There are five private pathologist-supervised laboratories: one in Prince Albert, one in Saskatoon, and three in Regina. In 1978/79, there was one such laboratory in Saskatoon and two in Regina.

In 1983/84, there were 337 physicians' laboratories billing under the Medical Care Insurance Commission's List 1 of the fee schedule, and an additional 42 laboratories billing under List 2. In 1978/79 there were 304 List 1 and 23 List 2 laboratories. In the tables that follow, tests billed under both Lists have been combined.

The hospital sector is the most complicated, since their laboratories vary widely in size, equipment, staff and range of tests performed. The hospitals were grouped for analysis according to the "Average Daily Census" approved in the relevant fiscal year. The number of hospitals included per ADC for 1983/84 is listed below.

ADC	NUMBER
0 - 9.9	48
10 - 14.9	24
15 - 19.9	21
20 - 24.9	10
25 - 34.9	7
35 - 49.9	3
50 - 100	7
Regionals	7
Base	6
Total	133

We found that, in most instances, some of the ADC groupings could be consolidated. Major differences in the hospital laboratories were generally noted at the following divisions:

0 - 14.9
15 - 24.9
25 - 50
50 - 100
Regionals
Base

Hospitals in the 50-100 size range are often referred to as "large community hospitals". They provide a mix of primary and secondary care. The "Regional" hospitals, providing mainly secondary care, are:

North Battleford - The Battlefords Union (ADC 163.8)
Prince Albert - Victoria Union (ADC 186.1)
- Holy Family (ADC 116.3)
Yorkton - Yorkton Union (ADC 245.2)
Moose Jaw - Moose Jaw Union (ADC 175.5)
- Providence (ADC 113.1)
Swift Current - Swift Current Union (ADC 120.4)

The "Base" hospitals are tertiary care facilities.

Regina	- Regina General (ADC 437.9)
	- Pasqua (ADC 321.6)
	- Plains Health Centre (ADC 232.0)
Saskatoon	- City (ADC 295.8)
	- St. Paul's (ADC 291.0)
	- University (433.0)

In the Regional category, the Holy Family Hospital has no laboratory facilities; the laboratory in the Victoria Union serves both facilities. While the University Hospital is usually categorized as a "Base Hospital", at times it is separated from the other five "service hospitals" when its unique nature as a teaching institution significantly changes the statistics for the group.

The Provincial Laboratory is a single facility located in Regina.

NOTE OF CAUTION

In order to obtain test information on the hospitals it was necessary to use monthly data. While monthly data is used to compare, in the following section, the relative proportions of tests performed by the four laboratory sectors they are highly approximate indicators only.

2. THE GROWTH OF LABORATORY TESTING

2.1 Hematology

The following table summarizes the performance of hematology tests in November, 1979 and 1984.

TOTAL HEMATOLOGY TESTS

LABORATORY SECTOR	November 1979	% Total Nov. 79	November 1984	% Total Nov. 84	% Change Nov. 79 - 84
Hospital Laboratories	234,328	72.4	296,178	70.2	26.4
Physician Office Labs	45,549	14.1	64,427	15.3	41.4
Pathologist-Supervised Labs	43,776	13.5	61,539	14.6	40.6
Provincial Laboratory	0	0	0	0	0
TOTALS	323,653	100.0	422,144	100.0	30.4

Sources: Hospital Questionnaire, MCIC, Provincial Laboratory

The Provincial Laboratory does not have a hematology section. The hospitals perform the large majority of tests, but the private laboratories' growth appears to have been considerably faster.

Only a very small number of hematology tests are referred to other laboratories since whole blood deteriorates quickly.

Inpatient testing is the exclusive reserve of the hospitals. Overall, it has grown moderately, with the regional and base hospitals performing a greater share of the total and those under "50 beds" declining in relative terms.

INPATIENT HEMATOLOGY TESTS

HOSPITAL SIZE GROUPS BY APPROVED DAILY CENSUS	November 1979	% Total Nov. 79	November 1984	% Total Nov. 84	% Change Nov. 79 - 84
0 - 14.9	8,040	6.0	8,324	5.4	3.5
15 - 24.9	9,970	7.5	10,932	7.1	9.6
25 - 49.9	7,890	6.0	8,715	5.7	10.5
50 - 100	9,443	7.1	10,934	7.1	15.7
Regionals	20,977	15.8	26,381	17.2	25.8
Base	62,672	47.1	69,659	45.4	11.2
University	13,872	10.4	18,482	12.1	33.2
TOTALS	132,864	100.0	153,427	100.0	15.5

Sources: Hospital Questionnaire

Outpatient testing* is the major growth area, in the hospitals as well as the private laboratories. All of the private laboratories' work in Saskatchewan is with outpatients, whether the specimens are obtained on-site, or referred from physicians' offices.

OUTPATIENT HEMATOLOGY TESTS

LABORATORY SECTOR	November 1979	% Total Nov. 79	November 1984	% Total Nov. 84	% Change Nov. 79 - 84
Hospital Laboratories	95,611	51.7	129,020	50.6	34.9
Physician Office Labs	45,549	24.6	64,627	25.3	41.4
Pathologist-Supervised Labs	43,766	23.7	61,539	24.1	40.6
Provincial Laboratory	0	0	0	0	0
TOTALS	184,926	100.0	254,986	100.0	37.9

Sources: Hospital Questionnaire, MCIC, Provincial Laboratory

---

* The term "outpatient testing" is used to describe tests for all patients who are not "inpatients", including the ambulatory patients of private laboratories.

While growth of this section has occurred every year over the period under examination, by far the fastest period of expansion was up to 1980 - 1981. After 1981, growth in the physicians' office laboratories considerably slowed. It is difficult to spot a trend in the monthly data for the free-standing private labs, but growth there appears to have slowed, as well. A lack of time did not allow compilation and extrapolation of all years' data for the hospital sector. A review of the questionnaire suggests, however, that the main surge of growth took place also up to the 1980 - 1981 period, mainly in the smaller hospitals.

HEMATOLOGY - PRIVATE LABORATORIES

PRIVATE LABORATORIES	VOLUME OF TESTS (NOVEMBER)					
	1979	1980	1981	1982	1983	1984
Physician Offices	45,549	51,082	59,733	62,721	63,685	64,427
Pathologist-Supervised	43,776	51,576	55,716	50,969	57,527	61,539
TOTAL	89,325	102,658	115,449	113,690	121,212	125,966

Source: MCIC

2.2 Biochemistry

Biochemistry is the largest section in terms of the number of tests performed, even though the numbers are inflated due to the use of automatic profiling equipment.

TOTAL BIOCHEMISTRY TESTS

LABORATORY SECTOR	November 1979	% Total Nov. 79	November 1984	% Total Nov. 84	% Change Nov. 79 - 84
Hospital Laboratories	468,395	66.8	494,555	59.9	5.6
Physician Office Labs	46,973	6.7	68,002	8.2	44.8
Pathologist-Supervised Labs	30,048	4.3	79,255	9.6	163.8
Provincial Laboratory	156,071	22.3	183,714	22.3	17.7
TOTALS	701,487	100.0	825,526	100.0	17.7

Sources: Hospital Questionnaire, MCIC, Provincial Laboratory

In the aggregate, growth of biochemistry testing has not been spectacular. Part of the reason for the slow total growth in the hospital sector is reflected in the next chart. In 1980/81 the University hospital replaced its profiling machines (SMA-12 and SMA-6) with discreet analyzers, and at the same time required that only discreet tests could be ordered. If the University Hospital's laboratory is removed from the calculations above, the number of hospital biochemistry tests increased from 373,962 in November, 1979 to 434,680 in November, 1984 or 16.2 percent.

INPATIENT BIOCHEMISTRY TESTS

LABORATORY SECTOR	November 1979	% Total Nov. 79	November 1984	% Total Nov. 84	% Change Nov. 79 - 84
Hospitals (by ADC):					
0 - 14.9	5,546	2.1	7,424	2.7	33.9
15 - 24.9	6,083	2.2	7,839	2.8	28.9
25 - 49.9	5,894	2.2	6,916	2.5	17.3
50 - 100	10,323	3.9	12,331	4.5	19.4
Regionals	31,587	11.8	40,673	14.8	28.8
Base	113,469	42.5	121,573	44.1	7.1
University	62,365	23.4	37,907	13.8	- 39.2
SUB-TOTAL	235,267	88.1	234,663	85.2	- 0.3
Provincial Laboratory *	31,815	11.9	40,777	14.8	28.2
TOTALS	267,082	100.0	275,440	100.0	3.1

Sources: Hospital Questionnaire, AR-1's.

* The number of inpatient tests performed by the Provincial Laboratory is derived from the AR-1's -- "number of tests requested on specimens referred-out" to the Provincial Laboratory.

Inpatient testing grew by far the fastest in the small hospitals, as they added new equipment over the period (for example, two or four channel electrolytes). The Provincial Laboratories' growth mirrors that in the small hospitals, from which it receives most of its specimens.

If the University Hospital is again removed from the calculation, the hospitals increased their inpatient testing by 13.8%.

Outpatient biochemistry tests, however, have increased markedly in almost all sectors. While the table below suggests that overall hospital outpatient testing has grown moderately, in fact the hospitals outside Regina and Saskatoon increased testing from between 40 percent to 75 percent (see Appendix G(2)).

OUTPATIENT BIOCHEMISTRY TESTS

LABORATORY SECTOR	November 1979	% Total Nov. 79	November 1984	% Total Nov. 84	% Change Nov. 79 - 84
Hospital Laboratories	106,518	31.4	126,335	27.6	18.6
Physician Office Labs	46,973	13.8	68,002	14.9	44.8
Pathologist-Supervised Labs	30,048	8.8	79,255	17.3	163.7
Provincial Laboratory	156,071	46.0	183,714	40.2	17.7
TOTALS	339,610	100.0	457,306	100.0	34.7

Sources: Hospital Questionnaire, MCIC, AR-1's, Provincial Laboratory.
* The number of outpatient tests performed by the Provincial Laboratory is estimated as all biochemistry tests reported as performed less those derived as inpatient tests per the AR-1's.

Growth of tests in the physicians' offices parallels that in the smaller hospitals. The truly significant growth shows up in the private pathologist-supervised laboratories.

The table below demonstrates the rapid growth of biochemistry tests in the private laboratories.

BIOCHEMISTRY

LABORATORY SERCTOR	VOLUME OF TESTS (NOVEMBER)					
	1979	1980	1981	1982	1983	1984
Physician Offices	46,973	51,897	62,637	62,859	64,592	68,002
Pathologist-Supervised	30,048	35,428	42,228	56,959	53,953	79,255
TOTAL	77,021	87,325	104,865	119,818	118,545	147,257

Source: MCIC

2.3 Microbiology

The following table illustrates the overall growth in the microbiology section. The different laboratory sectors have not been totalled because of problems of definition as to what constitutes a "test" in this section.

MICROBIOLOGY TESTS

LABORATORY SECTOR	November 1979	November 1984	% Change Nov. 79 - 84
Hospital Laboratories	28,608	38,240	33.7
Physician Office Labs	1,334	2,913	118.4
Pathologist-Supervised Labs	5,642	14,672	160.0
Provincial Laboratory	24,996	27,625	10.5

Sources: Hospital Questionnaire, MCIC, Provincial Laboratory

Total growth appears to have been quite significant in all the sectors except the Provincial Laboratory. Since it is by far the largest institution doing this testing in the province, however, a relatively slower growth is to be expected.

INPATIENT MICROBIOLOGY TESTS

LABORATORY SECTOR	November 1979	November 1984	% Change Nov. 79 - 84
Hospitals (by ADC)			
0 - 14.9	0	0	0
15 - 24.9	0	0	0
25 - 49.9	97	437	350.5
50 - 100	653	843	29.1
Regionals	4,122	5,384	30.6
Base	14,493	16,936	16.9
Subtotal	19,365	23,600	21.9
Provincial Laboratory *	3,011	4,279	42.1

Sources: Hospital Questionnaire, AR-1's

* The number of inpatient tests performed is derived from the AR-1's -- "number of tests requested on specimens referred-out" to the Provincial Laboratory.

Information from the hospital questionnaires shows that virtually no microbiology tests are performed in the hospitals up to 25 ADC in size. Most of these institutions are staffed by Certified Combined Technicians (lab and X-ray) who are not trained in microbiology. The growth of testing on-site in the 25 ADC to Regional categories has grown considerably as staff qualifications and/or procedural methodologies have improved. Still, it appears that very little inpatient work is performed outside the Base hospitals and Provincial laboratories.

Outpatient microbiology testing over the five-year period has apparently grown faster than the other sections, although the absolute number of tests is relatively quite small.

OUTPATIENT MICROBIOLOGY TESTS

LABORATORY SECTOR	November 1979	November 1984	% Change Nov. 79 - 84
Hospital Laboratories	7,143	9,831	37.6
Physician Office Labs	1,334	2,913	118.4
Pathologist-Supervised Labs	5,642	14,672	160.0
Provincial Laboratory *	21,985	23,346	6.2

Sources: Hospital Questionnaire, MCIC, AR-1's, Provincial Laboratory.
* The number of outpatient tests is the total as reported by the Provincial Laboratory less the inpatient tests reported per the AR-1's.

Year-to-year growth in the private sector has been very consistent, but it appears the physicians are peaking in their performance of tests on-site. It should be noted that physicians only perform two "tests", however. The examination of slides for trichomonas, yeasts, etc., has doubled over the period; the spot test for mononucleosis was not performed in 1978.

MICROBIOLOGY*

LABORATORY SECTOR	VOLUME OF TESTS (NOVEMBER)					
	1979	1980	1981	1982	1983	1984
Physicians Offices	1,334	2,109	2,846	2,839	2,770	2,913
Pathologist-Supervised	5,642	6,131	7,303	9,540	10,821	14,672
TOTAL	6,976	8,240	10,149	12,379	13,591	17,585

Source: MCIC
* Includes Serology

3. OUTPATIENT AND INPATIENT TESTING

The previous analysis suggests that outpatient testing is clearly the growth area for laboratories. As hospital admissions and patient-days are held more or less constant, more testing is done on patients outside the hospital.

LABORATORY SECTOR	PERCENT GROWTH OF TESTS: November 1979 to November 1984					
	HEMATOLOGY		BIOCHEMISTRY		MICROBIOLOGY	
	IN PATIENT	OUT PATIENT	IN PATIENT	OUT PATIENT	IN PATIENT	OUT PATIENT
Hospitals by ADC:						
0 - 14.9	3.5	91.7	33.9	40.0	n/a	n/a
15 - 24.9	9.6	29.8	28.9	44.9	n/a	n/a
25 - 49.9	10.5	52.3	17.3	57.8	350.5	281.2
50 - 100	15.8	46.3	19.5	74.1	29.1	49.5
Regionals	25.8	32.6	28.8	49.6	30.6	27.5
Base	11.1	29.6	7.1	23.3	18.8	21.1
University	33.2	33.2	-39.2	-31.4	15.3	67.9
SUB-TOTAL	15.6	34.9	- 0.1	18.6	21.9	37.6
Physician Offices	n/a	41.1	n/a	44.8	n/a	118.4
Pathologist-Supervised	n/a	40.6	n/a	163.8	n/a	160.0
Provincial Laboratory	n/a	n/a	28.2	17.7	42.1	6.2
TOTAL	15.6	37.9	3.1	34.7	n/a	n/a

Sources: Hospital Questionnaire, AR-1's, MCIC

As the hospital size increases, the general trend is for slower growth in the testing of both inpatients and outpatients but the growth of outpatient tests continues to be greater. This slower growth of hospital testing in the cities is offset by substantial increases in activity by the private laboratories.

The Provincial Laboratory, which receives most of its requests for tests from hospitals under 50 ADC, appears to counter the trend. We assume that physicians in those hospitals are ordering an increasing array of sophisticated tests for their inpatients that is far beyond the capabilities of the smaller hospital laboratories. Very few hospitals under 50 ADC do any microbiology, of course.

4. SUMMARY AND CONCLUSION

The following table summarizes the actual growth of testing by the private laboratories, and the apparent growth in the public laboratories.

FIVE-YEAR GROWTH OF TESTS *

LABORATORY SECTORS	HEMATOLOGY	BIOCHEMISTRY	MICROBIOLOGY
Physician Offices	46.9%	34.7%	150.4%
Pathologist-Supervised	7.4%	63.6%	22.9%
Hospitals	26.4%	5.6%	33.7%
Provincial Laboratory	n/a	17.7%	10.5%

Sources: MCIC, Hospital Questionnaires, Provincial Laboratory
* Private Laboratories' growth based on annual totals, 1978 and 1983/84; Public Laboratories growth based on monthly totals, November 1979 to November 1984.

The reviewers hesitate to draw many conclusions from the data because of the apparent divergences in results between the monthly and annual numbers.

The disparities in the statistics are least in the physician office sector. There is little doubt physicians have increased their on-site testing more rapidly than they have used other facilities.

Pathologist-supervised laboratories appear to have grown modestly relative to other sectors. The surge in biochemistry seems to be partly linked to the introduction of the "biochemistry panel" in the fee schedule in 1983. Biochemistry tests have increased significantly in all the laboratories, however, with exception of the University and Base hospitals.

Growth of testing in hospitals, it appears, has largely been in those outside of Regina and Saskatoon. The smaller hospitals, as well, have referred an increased amount of tests to the Provincial Laboratory. Although the Provincial Laboratory's growth appears slower than the other sectors, the absolute number of tests it has performed is a large proportion of the provincial total.

THE UTILIZATION OF LABORATORY FACILITIES

1. CAUSES OF THE GROWTH IN UTILIZATION

There is no doubt that the 1960's and 1970's witnessed an explosion in the number of tests ordered by physicians. There are a great number of reasons for this, well documented in the literature, and they are worth reviewing before examining Saskatchewan's recent experience.

1.1 Physicians

Only the physician can order laboratory tests: the laboratory must respond by performing them.

The ordering patterns of physicians are not uniform. Much depends on their medical training. If their exposure was one that encouraged laboratory utilization, this will be reflected in their medical practice. The family practitioner will have a vastly different pattern of ordering tests than that of specialists.

The younger inexperienced doctor tends to use the laboratory with greater frequency. This gives a sense of security. With experience, the physician tends to order fewer tests.

There is a philosophy with some doctors that by ordering a multitude of unrelated tests, this will save the patient a return trip and possibly more tests. This increases work-load on the laboratory, but it is encouraged by a few, as a cost saving measure, so the patient does not have to return for more tests.

Physicians tend to use the laboratory with increased frequency if it is readily available, has a reasonable scope of procedures, and results are returned promptly. This is readily noted in work-load increases concomitant with laboratory up-grading. In common with everyone else, if doctors have the tools available, they tend to use them.

In today's milieu the ever present threat of litigation forces many physicians into a defensive position. This results in increased laboratory requests.

The University Hospital is expected to have a much higher utilization rate because of its additional roles in the teaching and research areas. This work-load tends to overflow into regional hospital laboratories (e.g. patients entered into tumor protocols that have some medical care at the local level).

As the population ages, there is an increase in a variety of medical diseases. This is reflected in increasing hospital admissions and an increase in on-going medical attention. The laboratory is used in ever greater volumes.

Patients are better educated today and are exposed to popular medical television programs along with a variety of medical articles in magazines (e.g. Readers Digest). They demand services that they perceive are readily available elsewhere.

Whether physician ownership of laboratories encourage increased utilization is a debatable point, but it must be considered.

1.2 Hospitals

Routine admission profiles, i.e. a rigid list of tests that must be done on each patient that is admitted, in some hospitals include a very extensive scope. There appears to be no particular pattern based on need, size or physician. Some very small hospitals, which deal with the least complicated medical cases, demand the most. There are much larger hospitals that require very few admission tests on a routine basis.

Almost universally in Saskatchewan, all laboratory work is repeated when the patient is transferred from a smaller to a larger hospital.

As the average length of stay in the hospital decreases, there is an increased admission rate. This increased turn-over rate results in an ever-increasing laboratory work-load (due in part to the detailed admission profiles). In addition, most diagnostic work-up is done in the first few days of each admission.

1.3 The Authorities and Preventative Medicine

Public Health authorities encourage the screening of the population for selective conditions which, if found early enough can salvage the individual and, in most cases, allow a normal life. There is ever-increasing pressure to add to this program since many show a positive cost/benefit ratio. Programs to monitor the newborn for inborn errors of metabolism, a thyroid test to discover potential cretins, etc., are a few examples.

Various organizations require medical examinations that often include laboratory work. In the work place, a medical certificate is required after illnesses. Various school boards require medical examinations of children. Many recreation camps for children require medical certificates. All of these requests add to the work-load on the laboratory component.

Some medical experts, along with results from elegant and important research work, proclaim the importance of health care as practiced by the individual. "Participaction" is sweeping the country and costs are minimal. However, there are other areas - such as regular tonometry to

diagnose glaucoma affects the health system. The laboratory is affected in the regular Pap smear to detect early cancer of the cervix; regular determinations of cholesterol, triglycerides, high density lipoprotein cholesterol (HDL) are used to monitor patients with essential hypertension; the regular testing for glycolysated haemoglobin in the follow-up and management of juvenile diabetics; and many others.

1.4 Laboratories

Laboratories, in turn, affect utilization rates.

By providing good service, rapid turnaround of results, and excellent accessibility, the physician will probably use the laboratory to a greater extent (albeit in the best interests of the patient).

Massive testing (multiphasic), where a battery of tests having one thing in common - an instrument capability, has and is being promoted. Proponents encourage the physicians to use this approach under the pretext that each test in a profile costs pennies.

Laboratories often provide detailed, elaborate requisition forms that allow easy "tick-off" of the tests, or profiles, that should be done as contrasted to a simple form with a few common procedures listed and that requires the physician to document others. Ontario uses the latter approach with some success in containing utilization.

2. LABORATORY UTILIZATION IN SASKATCHEWAN

The term utilization has come to be almost synonymous with "overutilization". Much of the literature on the subject addresses overutilization by physicians, and pathologists would agree that some physicians order a great number of unnecessary and unrelated tests on their patients.

The appropriateness of physicians' use of the laboratory is not something we can measure statistically, however. As noted earlier, individual doctors can vary widely in their utilization practices for very defensible reasons. Overutilization can only be measured relative to the physician's peer group.

We can, however, examine whether a <u>growth</u> in utilization is responsible for the growth of testing in Saskatchewan. The tables below summarize our findings with respect to the hematology and biochemistry sections.

BIOCHEMISTRY

NUMBER OF TESTS PER PHYSICIAN	REGINA & SASKATOON	5 OTHER CITIES*	ALL OTHER SASK. LOCATIONS	TOTAL
1983/84	11,409	7,792	8,119	9,929
1978/79	11,312	7,535	6,208	9,101
GROWTH OF BIOCHEMISTRY TESTS PER PHYSICIAN	0.9%	3.4%	30.8%	9.1%

Sources: Appendix G, MCIC, AR-1's
* Moose Jaw, Prince Albert, Yorkton, North Battleford, Swift Current

HEMATOLOGY

NUMBER OF TESTS PER PHYSICIAN	REGINA & SASKATOON	5 OTHER CITIES	ALL OTHER SASK. LOCATIONS	TOTAL
1983/84	4,771	4,476	4,282	4,637
1978/79	5,144	4,223	3,546	4,493
GROWTH OF HEMATOLOGY TESTS PER PHYSICIAN	- 7.3%	6.0%	20.8%	3.2%

Although the numbers must be regarded as estimates, it is obvious that physicians as a whole in Saskatchewan have increased their utilization of the laboratory. Doctors in the two major centres have not increased utilization, however, in fact just the opposite. Increases in utilization over the past five years have come primarily from the rural physician.

We interpret this primarily as "catch-up" on the part of rural doctors. Extensive laboratory facilities have been available for many years in the Base hospitals; Regina and Saskatoon also have private laboratories and the Provincial Laboratory close at hand. Urban physicians have reached a saturation point in the number of tests they can order. Rural physicians, on the other hand, still perform fewer tests per patient but are catching up to their urban colleagues as they become aware of new tests available and local hospital laboratories improve.

The table below appears to reinforce this conclusion.

HOSPITALS BY ADC GROUPS	ON-SITE TESTS PER ADMISSION: CHANGE 78/79 TO 83/84	
	HEMATOLOGY	BIOCHEMISTRY
0 - 14.9	22.6%	58.3%
15 - 24.9	19.5	40.6
25 - 49.9	23.1	30.7
50 - 100	28.6	32.6
Regionals	18.7	21.5
Base	1.7	- 5.4
University	10.0	- 49.8
TOTAL	14.5%	- 0.1%

Sources: Hospital Questionnaire and AR-1's

The tests per physician is also affected by the number of patients, but it is not possible to provide a breakdown of patients by location since many of those treated in the tertiary care centres live in rural areas. The following table suggests, however, that a growing utilization by physicians is not a major factor in Saskatchewan, as a whole, apart from the rural physicians. Otherwise, the growth of testing here has been caused by the growing number of physicians and the growing population.

TESTS PER PHYSICIAN PER 1,000 BENEFICIARIES	1978/79	1983/84	PER CENT CHANGE
BIOCHEMISTRY	9.38	9.79	4.4%
HEMATOLOGY	4.63	4.57	- 1.3%

Sources: Appendix G, MCIC, AR-1's, SHSP

REFERRAL PATTERNS

1. INTRODUCTION

All laboratories refer a proportion of the tests requested of them to larger or more specialized laboratories. Small laboratories, particularly in rural hospitals, perform a very limited range of tests on-site. Low volume tests will not be carried out on-site for economy reasons, and for the fact that a minimum, consistent volume is required for the laboratory staff to maintain proficiency in any procedure. Thus, the small laboratories will refer a high proportion of specimens to larger labs, and this proportion will decline as the size of the laboratory grows. Even the University and Provincial laboratories, however, continue to refer thousands of tests each year to larger institutions like the Mayo Clinic and the Hamilton Reference Centre.

With two-thirds of its population residing outside of Regina and Saskatoon, the referral of specimens is a very important aspect of laboratory services in this province. A referred specimen requires transportation, often over vast distances. In Saskatchewan, the only means of transporting specimens from the many widespread communities to the larger cities is the highway. While the highway system is generally excellent, the modes of transport options are limited.

The referral of specimens has, consequently, been one of the most controversial areas in the Review.

2. HEMATOLOGY AND SURGICALS

Very few hematology tests are referred to other laboratories. Even the smallest of our hospital laboratories have the capability to perform most of the tests routinely required by physicians. Of the 83,000 tests referred by hospitals in 1983/84, the majority were destined for the Canadian Red Cross Blood Transfusion Service Laboratories in Regina and Saskatoon.

Since hematology tests are usually performed on whole, fresh blood, the Provincial Laboratory does not conduct hematology testing.

We have not examined the referral of specimens in the field of surgical pathology. All surgicals from rural areas are referred to pathologists located in Regional and Base hospitals. We found that practitioners were quite satisfied with this arrangement.

Most referral testing takes place in the biochemistry and microbiology sections.

3. BIOCHEMISTRY

The following table summarizes the number of tests requested on specimens referred-out from the province's hospitals.

1983/84 BIOCHEMISTRY TESTS REFERRED-OUT

HOSPITAL SIZE GROUP	INPATIENT	OUTPATIENT	TOTAL	TO PROVINCIAL LAB
A.D.C. 0 - 24.9	362,792	664,990	1,027,800	1,006,748
A.D.C. 25 - 49.9	47,679	160,400	208,079	185,542
A.D.C. 50 - 100	25,628	27,418	53,046	52,845
Regionals	50,994	50,648	101,610	52,524
Base	50,961	28,617	79,578	49,361
TOTALS	538,004	932,091	1,470,095	1,337,020

Source: AR-1's 1983/84

It is immediately apparent that virtually all the referred biochemistry tests from hospitals below the Regional size are performed by the Provincial Laboratory. The proportion is a little less in the 25-50 bed size as a few hospitals in the west-central region have an arrangement to refer their requirements to the University Hospital. Referrals from the Regional and Base hospitals are for more esoteric tests, as they have the capability on-site to do their own routine tests.

It was our expectation that biochemistry referrals would have dropped over the 1978/79 to 1983/84 period with the introduction of more and better chemistry analyzers (eg. electrolytes) into hospitals under 50 ADC. This was not the case, however. While on-site tests did increase by 37 percent in this group, referrals increased by 44 percent.

The table below illustrates the extent of biochemistry referrals in hospitals of various size. The Base hospitals refer a minimal proportion of their work. The Regionals refer a higher percentage but as their capabilities have increased the proportion of referrals has declined. The same trend is even more marked with the large community hospitals. Those under 50 ADC, however, have increased slightly their proportion of referrals.

BIOCHEMISTRY - HOSPITALS

HOSPITAL SIZE GROUP	TESTS REFERRED-OUT AS A PERCENTAGE OF TOTAL TESTS PERFORMED ON-SITE	
	1978/79	1983/84
A.D.C. 0 - 24.9	215%	238%
A.D.C. 25 - 49.9	131%	133%
A.D.C. 50 - 100	34%	19%
Regionals	17%	10%
Base	2%	2%

Sources: Hospital Questionnaire, AR-1's 1978/79 and 1983/84

Drawing from the analysis of utilization, we can only conclude that the rapid increase in testing by rural physicians has far outstripped the capabilities of the smaller hospital laboratories, even those with expanded capabilities.

4. MICROBIOLOGY

The following table summarizes the number of tests requested on specimens referred-out from the province's hospitals.

1983/84 MICROBIOLOGY TESTS REFERRED-OUT

HOSPITAL SIZE GROUP	INPATIENT	OUTPATIENT	TOTAL	TO PROV. LAB
A.D.C. 0 - 24.9	30,951	42,819	73,770	64,471
A.D.C. 25 - 49.9	4,805	6,872	11,677	9,511
A.D.C. 50 - 100	2,710	2,451	5,161	5,067
Regionals	13,979	11,099	25,078	13,759
Base	13,106	3,273	16,379	10,650
Totals	65,551	66,514	132,065	103,458

Source: AR-1's 1983/84

As in the clinical chemistry area, the majority of specimens referred-out by hospitals are directed to the Provincial Laboratory. Hospitals directed 91% of biochemistry tests to the Provincial Laboratory, compared to 78% of microbiology tests. Almost all the hospitals under 100 beds directed all microbiology tests to the Provincial Laboratory.

MICROBIOLOGY - HOSPITALS

HOSPITAL SIZE GROUP	1978/79 PERFORMED ON-SITE	1978/79 REFERRED OUT	1983/84 PERFORMED ON-SITE	1983/84 REFERRED OUT
A.D.C. 0 - 24.9	0	53,000	0	73,770
A.D.C. 25 - 49.9	3,672	14,585	18,492	11,677
A.D.C. 50 - 100	16,392	4,682	23,448	5,161
Regionals	97,968	17,605	138,324	25,078
Base	225,264	6,317	278,616	16,379
Total	343,296	96,189	458,880	132,065

Source: Hospital Questionnaires, AR-1's 1978/79 and 1983/84

Total referrals have grown 37%, and those to the Provincial Laboratory have risen 46%. Referrals from hospitals with less than an A.D.C. of 25, which make up more than half the total, rose only slightly faster than the total referrals. Referrals fell in the 25-50 bed category as their on-site routine tests grew fivefold over the period. Referrals from the large community hospitals grew slowly, as on-site tests increased 43%.

5. OTHER REFERRALS

Apart from Papanicolau smears, physicians refer very few specimens directly to laboratories. If they cannot perform the tests in their own labs, most doctors prefer to have the patient visit the local private or hospital lab.

REFERRAL OF SPECIMENS	1978 NUMBER	1983/84 NUMBER	% CHANGE
Physicians:			
Regina and Saskatoon	758	1,344	77%
5 Other Cities	554	920	66%
Other Locations	1,158	909	- 21%
Sub-Total - Physicians	2,470	3,173	28%
Pathologist - Supervised Labs	56,871	123,265	117%
Total	59,341	126,438	113%

Source: MCIC

Although the number of referrals made by physicians appears to have changed sharply, the number in 1983/84 remains far less than one percent of the total specimens referred in the province each year. The use of the pathologist-supervised laboratories in the larger cities is again borne out by the rapid increase in the referrals these labs have generated. Though information is not available as to where the private labs referred the specimens, it is our understanding that most go to the Provincial Laboratory.

The other major group of referrals is the Pap smear. The majority of these are referred to the provincial cytology centre at the Pasqua Hospital in Regina. In addition to those directed by physicians, a few thousand specimens are referred to the Pasqua by other hospitals.

REFERRAL OF PAPANICOLAU SMEARS	1978	1983/84	% CHANGE
Physicians:			
Regina & Saskatoon	68,415	82,522	20.6
5 Other Cities	24,550	28,029	14.2
Other Locations	34,903	35,645	2.1
Total	127,868	146,196	14.3

Source: MCIC

ROLES OF THE LABORATORY SECTORS

1. HOSPITALS

Hospitals provide the majority of laboratory services in Saskatchewan.

The primary role of all hospital laboratories is to serve their own institution's inpatients. Outpatients do play an important role in the workload of all hospitals, however, and their relative importance increases as the facility decreases in size and complexity.

1.1 Base Hospitals

The six Base hospitals, including the University Hospital, are all relatively large and diversified in their services. As the province's tertiary care centres, their laboratories are primarily geared to supporting the kinds of care offered by their hospitals. The University Hospital's laboratory, of course, must also cope with supporting the teaching and research programs of the College of Medicine.

The Base hospitals' laboratories perform a considerable amount of outpatient work, but this appears to be very much tied to the specialized clinics that most of them maintain. Their outpatient departments, for the most part, are not geared to serve the local patients' routine testing requirements.

Nor do these hospitals act as referral centres for hematology, microbiology and biochemistry tests. The Regina General Hospital performs a considerable amount of work on behalf of the Provincial Laboratory, somewhat on a quid pro quo basis. The University acts as a referral centre for three or four rural hospitals, and does some virology for the Saskatoon area. The Pasqua Hospital in Regina houses the provincial centre for cytology. These are exceptions rather than the rule, however.

1.2 Regional and Large Community Hospitals

As secondary care centres, the six Regional hospital laboratories generally have sufficient on-site testing to meet their major needs. Although each has at least one pathologist on-site, the numbers and qualifications of these physicians vary quite markedly from place to place.

It was our impression that most of the Regionals had some excess capacity in equipment and space, though equipment capacities vary widely. The same impression applies to the Large Community hospitals.

One Large Community hospital has a pathologist on-site, and several have consulting pathologists. Several others, however, have no association with a pathologist. While in some cases the routine testing capabilities of the Large Community group equals that of some Regional hospitals, those without pathologists cannot offer the same scope of services or consultative capacity for local physicians.

Hospitals in this broad category offer fairly extensive out-patient services to their communities. They are really the only options in most cities and towns. In providing outpatient laboratory services, the Regionals encounter many of the difficulties and inconveniences incurred by the Base hospitals. Space for receiving outpatients is at a premium, as is parking. The hospitals are often located quite distant from the doctor's offices. Yet, these hospitals rely to a considerable extent on outpatient volume to maintain the scope and level of laboratory services they maintain primarily for the care of inpatients.

1.3 ADC 25-50

The laboratories in hospitals funded for 25 to 50 patients daily are geared to primary care and outpatient work. The laboratories range from modest to elaborate. Equipment varies from minimal to extensive. The vast differences reflect the priorities of the medical staffs, the administrators and the Boards.

While most of the laboratories are staffed by Registered Technologists, the range of tests is not significantly higher than the ADC 15-25 group. Very few of these hospitals perform even basic microbiology procedures, despite the fact they have qualified technologists.

1.4 ADC 0-25

These hospitals are also geared to primary care and outpatient testing. Increasingly they are being linked with Level 3 and 4 care. Their laboratories vary greatly in size; in many cases large, underutilized laboratories reflect the decline in the patient load of the institutions. Equipment varies from virtually none to quite extensive.

Most of these laboratories act primarily as phlebotomy centres, referring the majority of their specimens to the Provincial Laboratory. They are generally staffed by Certified Combined Technicians, who divide their work between lab and X-ray.

The workload of these laboratories is fundamentally affected by the local physicians. Most of the communities with this size of hospital have only one or two doctors, and they tend to have a high turnover rate. One physician's style of practice can quadruple a laboratory's workload overnight. Similarly, another change of physician might cut its workload to almost nothing. Acting as an extension of the local physician's practice, the lone C.C.T. is generally in a very difficult position, as is the hospital administration.

1.5 Findings

There were a number of observations made through our on-site visits and the hospital questionnaires that should be noted.

STAFFING

The qualifications of laboratory personnel in Saskatchewan hospitals are generally satisfactory.

HOSPITALS (1) BY APPROVED DAILY CENSUS MAR. 31/84	LABORATORY TECHNOLOGISTS & TECHNICIANS (2)					
	FULL-TIME EMPLOYEES			PART-TIME EMPLOYEES		
	R.T.	C.C.T	NON-CERT	R.T.	C.C.T	NON-CERT
0 - 14.9	4	31	3	23	29	6
15 - 24.9	9	27	2	19	21	1
25 - 49.9	20	8	0	11	3	0
50 - 100	30	0	0	17	1	0
Regionals	83	0	0	26	0	0

Source: Hospital Questionnaires

Notes:
1. Table includes only respondents to Questionnaire.
2. Only Registered Technologists or Advanced R.T.'s, and Certified Combined Technicians are included. Non-certified employees are usually nurses, or R.T.'s not certified for laboratory work.
   Laboratory personnel with other professional qualifications such as M.Sc. and Phd. are not included. Most of these employees are with the six base hospitals.

The table above demonstrates how the staffing falls into two distinct strata. Full-time employees in institutions under 25 ADC are mostly CCT's. CCT's are generally lower-paid than RT's and their broader training - to include X-ray - makes them more flexible to the small hospital's needs. Part-time staff are almost equally CCT's and RT's. The large number of part-time RT's reflects, perhaps, their relatively poor job prospects in the past few years and "over-qualifications" for small hospitals.

Once over the 25 ADC level, however, the laboratories become dominated by the RT until the Base hospital level, when a great many other qualifications, such as Phd's and M.Sc.'s are present.

One matter of possible concern is the number of non-qualified personnel working in the smaller laboratories as technicians.

Many hospitals, in all size categories, complained of an inadequate number of staff. In the larger institutions, particularly Regionals but also a few Base hospitals, this reflected particularly on weekend and night coverage. These hospitals also believed they had a need for more specialist laboratory personnel - for example, microbiologists, toxicologists and biochemists.

SUPERVISION

Laboratory supervision comes in at a variety of levels.

In the Base and Regional hospitals, the pathologist is ultimately responsible for the laboratory and everything related to it although, in some of these, chief technologists really manage the laboratory.

Down to the 25 ADC size, there is usually an R.T. in charge of the laboratory and below that size it is usually a full-time CCT.

A problem that was raised many times was the lack of adequate supervision in the laboratories, particularly as they decrease in size. The CCT, in particular, is not equipped through his or her limited training to deal with many of the problems which arise on a daily basis. They have a limited understanding of their equipment, of quality control, and often their rights. Instances have been cited of physicians and administrators pressuring CCT's to perform work they are not qualified to do. If they are denied quality control materials, they still have to perform tests. In such situations, they have no one with authority to turn to or appeal to.

On the other hand, there is generally no one in authority looking "over the shoulder" of the personnel in small laboratories to ensure that they are performing adequately.

Very few hospitals in Saskatchewan have the services of a pathologist in the organization and supervision of their laboratories. Concomitantly, very few rural physicians have any contact with pathologists as consultants. Of the hospitals responding to the questionnaire, the following number had consulting pathologists.

ADC	NUMBER OF HOSPITALS	HOSPITALS WITH CONSULTING PATHOLOGISTS
0 - 14.9	46	7
15 - 24.9	25	6
25 - 49.9	8	6
50 - 100*	6	4

Source: Hospital Questionnaire

* Melfort has a full-time pathologist.

Of those with consulting pathologists, very few hospitals seem to know what to do with one. To some, the pathologist is almost a status symbol, but this person in fact is never consulted. There is no common understanding of what the consultant's role is beyond that of a casual advisor.

Many of the small hospitals do communicate with, and receive visits from, senior technologists with larger hospitals who are known as "regional consultants". While they have more direct interaction with the local laboratory staff than the pathologists do, their current role is also that of advisor. They have no common set of responsibilities and no authority.

SAFETY

A number of technologists raised the issue of safety standards in the laboratories, although it was not of widespread concern. No formal standards exist for such areas as: Blood Bank refrigerators, fume hoods/ventilation, incubators and other equipment, disposal of wastes and hazardous materials, and infection control.

Although laboratory personnel appeared to act responsibly in the area of safety, we found several instances in on-site visits to smaller hospitals where the technologist/technicians were uncertain of procedures or why they were following them.

We observed several other instances when laboratory personnel did not wear lab coats in the laboratory, and others when they wore their lab coats out of the laboratory and into the cafeterias.

Infection control programs vary widely in the province; very few hospital staff outside the larger cities appeared concerned about nosocomial infections.

Although a few small hospitals have installed exhaust cabinets (i.e. fume hoods) in their laboratories, there are also several over 50 ADC, including one Regional hospital, without such ventilation. Some of the microbiological and hematological procedures carried out in those hospitals are dangerous to the staff without better ventilation.

Although the current safety precautions appear to work well, we believe their informality and variability in most institutions are a matter for concern.

EQUIPMENT AND SUPPLIES

Among the larger hospitals the primary concern was the perceived lack of a rational planning process for the acquisition of major equipment, a cumbersome approval process, and an inappropriate funding mechanism.

In the smaller hospitals (under 50 ADC), the primary concerns were the laboratorians' ability to choose the most cost-effective equipment, the high cost of supplies (especially reagents), and inadequate budgets for supplies.

As noted earlier, the equipment in most laboratories appears to be appropriate to their needs, but below the Base hospitals it becomes very uneven.

Many of the technicians in the smaller hospitals expressed a desire for more formal assistance in purchasing - including an inventory of where they might acquire used equipment, and involvement in a group purchasing program.

QUALITY CONTROL

There are no provincial standards for quality control within the laboratory and there is no comprehensive external quality assurance program.

Most of the larger hospitals have excellent quality control programs and subscribe to national and international quality assurance programs. As the hospital size declines, internal quality control becomes very variable - we found instances where no program was followed, per se. Most of the province's hospitals subscribe, on a purely voluntary basis, to the Provincial Laboratory's "Proficiency and Standards" (PAS) program. The PAS unit supplies hematology and chemistry samples once a month to the hospitals. There is no formal follow-up, however, with the laboratories which are found to have tests that are "out-of-control".

RANGE OF ON-SITE TESTS

Very few hospitals responded that their current range of tests was adequate for their needs - whether the institutions were large or small. There were no severe shortfalls in capability, however. Many of the tests some hospitals wish to add are impractical on the basis of inadequate volumes. Some responses were rather surprising, however. There were a number of hospitals which wanted to add basic microbiology procedures; they had qualified staff and reasonable volumes of work. The Reviewers did not receive adequate answers why they simply did not add the procedures on their own initiative (the cost would not exceed a few hundred dollars a year).

The following table outlines the range of different tests available in the hospitals in the hematology and biochemistry sections. While the variations in the number of tests available is surprising, the average hospital laboratory appears to provide a reasonable capability.

HOSPITALS (1) BY APPROVED DAILY CENSUS MAR. 31/84	1983/84 RANGE OF ON-SITE TESTS					
	HEMATOLOGY (2)			BIOCHEMISTRY		
	LOW	HIGH	AVERAGE	LOW	HIGH	AVERAGE
0 - 14.9	1	12	8.1	0	21	7.5
15 - 24.9	6	16	9.8	2	24	13.2
25 - 49.9	8	13	11.3	9	28	16.3
50 - 100	10	15	12.3	19	36	23.9
Regionals	8	25	17.5	23	75	41.3
Base (3)	27	78	48.2	13*	108	85.2*

Source: **Hospital Questionnaires**

Notes:
1. Table includes only respondents to the Questionnaire.
2. Hematology does not include Blood Bank
3. - In estimating the range for the Base hospitals, only tests which appeared to be performed regularly were included; most have the capabilities to perform more than are shown.
   - The low of 13 in biochemistry is misleading as this hospital refers most biochemistry tests to another in the city.
   - The average of 85.2 in biochemistry excludes the hospital performing 13 tests on-site.

SERVICE TO OUTPATIENTS

The Base hospitals, as a rule, do not encourage routine outpatient work. They do not have the space, they are inconvenient to get to, and outpatient work can be disruptive to their laboratory routines. In the current situation they are also not staffed for outpatient work, as most of it is handled by private laboratories or the Provincial Laboratory. While the Base hospitals' outpatient workload is not insignificant, it appears to be mainly associated with special clinics maintained within the institutions.

Routine outpatient work is extremely important to the workload of the other hospitals' laboratories, however, as illustrated by the table below. Similar percentages apply in biochemistry.

ON-SITE HEMATOLOGY TESTS

HOSPITALS BY APPROVED DAILY CENSUS	INPATIENT TESTS AS A PERCENTAGE OF ALL ON-SITE TESTS		OUTPATIENT TESTS AS A PERCENTAGE OF ALL ON-SITE TESTS	
	NOV. 1979	NOV. 1984	NOV. 1979	NOV. 1984
0 - 14.9	49.9%	34.8%	49.5%	64.3%
15 - 24.9	46.2	41.5	53.9	57.3
25 - 49.9	52.0	43.6	48.0	55.5
50 - 100	56.7	52.5	39.2	45.7
Regionals	53.1	53.7	38.1	40.7
Base	74.9	69.3	20.1	21.6
Total	56.7%	51.8%	40.8%	43.6%

Source: Hospital Questionnaire

There is no doubt that the existing staff and equipment capabilities of the laboratories outside Regina and Saskatoon are due, in large part, to the volume generated through outpatients.

At the same time, however, it was our observation (and that of many physicians) that the "service" provided by the hospital laboratories was not uniformly good. Most physicians maintain offices hours until 5:00 p.m. or 6:00 p.m. Where there are no private laboratories, and the physician cannot perform the tests required in his office, the patient must travel to the hospital to provide specimens. Most laboratories discourage (or turn away) outpatients after 4:00 p.m., which requires a second trip on the part of the patient. The table below summarizes the outpatient hours of a number of hospitals.

Yorkton	Mon. - Fri.	8:00 a.m. to 4:00 p.m.
Melfort	Mon. - Sat.	8:00 a.m. to 4:00 p.m.
P.A. Victoria Union	Mon. - Fri.	8:00 a.m. to 3:30 p.m.
M.J. Providence	Mon. - Fri.	7:45 a.m. to 4:00 p.m.
M.J. Union	Mon. - Fri.	8:00 a.m. to 4:00 p.m.
Swift Current	Mon. - Fri.	8:00 a.m. to 11:00 p.m.
Battlefords	Tues - Fri.	8:00 a.m. to 12:00 noon

We believe that outpatient laboratory services should work in partnership with local physicians in the best interests of the patient. Having to move on to another location for tests can cause a great deal of hardship for patients, although it is often unavoidable. Making a second trip because the laboratory has closed intensifies economic hardship (lost worktime, taxi fare, baby-sitting costs), physical hardship for the elderly and truly ill, and emotional hardship (for example, extending a simple procedure over two days).

Most of the hospital laboratories, despite their reliance on outpatients for their workload, schedule their hours in the interests of inpatients and staff. Most hospitals, in our opinion, close outpatient laboratory services two or three hours too soon. In the list above, the Battlefords Union closes six hours too soon. On the other hand, the Swift Current Union provides exceptionally good service.

REFERRED-OUT TESTS

In a previous section it was noted that all of Saskatchewan's hospitals rely on referral laboratories very heavily. A significant proportion of the Regional and large community hospitals' tests are referred out. Hospitals below 50 ADC refer far more tests than they perform on-site. In the under 35 ADC category, inpatient tests represent between 30% and 40% of the total referred-out. The performance of the referral laboratories is obviously very important to the quality of care in the rural areas.

A few towns refer their routine chemistry and microbiology tests to the University Hospital. Specimens are shipped by bus and reports are received by TWX. This appears to be a satisfactory arrangement.

There are also intra-city referrals in Regina and Saskatoon on special tests. The Regina General Hospital and Provincial Laboratory have rationalized tests to a degree. The RGH performs most of the biochemistry tests for the Plains Health Centre. In Prince Albert, the Holy Family Hospital refers all of its specimens to the Victoria Union, and in Moose Jaw the Union Hospital performs some procedures for the Providence.

The bulk of referrals, however, flow from the hospitals under 50 ADC to the Provincial Laboratory in Regina. Most of the specimens are sent through the postal system, in special containers supplied by the Provincial Laboratory. A few specimens are shipped by bus or couriers. Reports are sent back by mail; abnormal results are sometimes phoned.

Our examination of the hospital questionnaires revealed a considerable number of complaints and some real dissatisfaction with this mail-order system. The questionnaire responses had to be interpreted, of course, so degrees of satisfaction or dissatisfaction rely to an extent on the reviewers' judgement.

We found there was much greater satisfaction with the Provincial Laboratory's service below a line from Kamsack to Davidson to Swift Current.

Above that line, the proportion of hospitals that were "dissatisfied" and would prefer other arrangements increased rapidly, especially towards the northwest. Distance and the postal system routes are undoubtedly the main problem with one centralized referral laboratory.

Most complaints were in the microbiology section. Turnaround time was the primary problem. Numerous hospitals (that is, their medical staff) also felt the Provincial Laboratory reported an unusually high proportion of "no-growths" in microbiology specimens due to death of the specimens in transit. The transportation time from distant points, and the exposure to severe heat and cold were suggested as the major causes of unsatisfactory results. A few hospitals expressed frustration with containers being broken or lost in transit. A word frequently used to describe the microbiology service was "unreliable", and a few physicians questioned the Provincial Laboratory's quality control procedures.

The number of complaints in the biochemistry area were almost as significant. They relate mainly to turnaround time, however. Tests run through the Provincial Laboratory's SMAC were not a focus of complaint - generally, the turnaround time was considered as good as possible, but most hospitals believed the electrolytes component should be on-site as a matter of principle. This also applied, to an extent, to cardiac enzymes.

Radio-immuno-assay came in for a considerable amount of complaints. T4 and T3 uptake were mentioned frequently. Our general impression is that a lot of the turnaround time complaints in the biochemistry section relate to tests that are batched.

On the whole the system appears to work, but far from perfectly. Some of the physicians' complaints on turnaround time are unrealistic - in many cases microbiology procedures could not be performed any faster on-site. In other situations, however, even though test results may not be necessary to the immediate management of the patient, it is easy to understand the frustration and uncertainty physicians feel with the current system.

REGIONAL SERVICE DEPARTMENTS

Regional Service Departments are located in four regional hospitals and at the Plains Health Centre in Regina. Funded by SHSP independently of the hospitals, they are a vestige of the Regional Hospital Councils. Each of the Departments services a region in the southern half of the province with professional consultant advice in a range of health services according to each region's priorities. These include physiotherapy, dietetics, accounting, laboratory and several others. Each of the regions is very large geographically, and includes an average of 25 hospitals each.

None of the Regions, except North Battleford, has a full-time laboratory consultant on staff. The number, location and methods of remuneration (if any) for the other consultants varies widely between regions. Apart from North Battleford, the consultants are usually senior technologists in Regional and large community hospital laboratories. To our knowledge, none of them is paid, though the Departments compensate the hospitals for part of the time they spend on regional matters.

Essentially, the consultants act as advisors to the technicians in the smaller hospitals. Periodically they hold educational seminars. A number of them have expressed great frustration with their role because:

- there is no uniform terms of reference for their work
- they have different reporting relationships to their Directors
- the regions are far too large to service
- there are no standards or guidelines provincially for staffing qualifications, quality control, methodologies, safety, etc.
- they feel they have responsibility, but they have no authority or real influence.

Our general conclusion is that while the Regional consultants individually assist the laboratory technicians in many ways, the current structure of the Regions and the Regional Service Departments are not very relevant to the real needs of Saskatchewan's rural hospitals.

2. THE PROVINCIAL LABORATORY

The Provincial Laboratory, a branch of the Department of Health, operates six days a week. It is a referral laboratory, accepting no out-patients. Specimens reach the laboratory mainly by the mail, though a few arrive by other means such as buses. Its service covers the entire province.

It provides support in the Public Health area such as water and milk analysis. It tests specimens for environmental hazards such as PCB, insecticides, etc. It is generally responsive to any special request from special sources. It undertakes the screening processes such as P.K.U., rubella, etc.

In the clinical medical sphere, the Provincial Laboratory provides referral services primarily in biochemistry, virology, microbiology. It does not do any hematology or surgical pathology.

It performs low volume sophisticated tests that are not performed in most hospitals (e.g. endocrinology). It does most of the immunology testing, such as for hepatitis, and a considerable proportion of the toxicology.

Its service is generally regarded as "mail-order". It provides very minimal consultative services. To a great extent they must rely on the mail service which is not very satisfactory for laboratory purposes. The routine biochemical tests are performed on a SMAC which for the most part gives reasonable turn-around times or results. This cannot be said for many of the other procedures. To effect cost savings, 'batching' has been used extensively. This, combined with sometimes erratic mail service, has resulted in unsatisfactory turnaround times for results. In microbiology, specimens frequently die on transit and the tests performed serve no useful purpose.

Most hospital laboratories have some biochemical testing capability. The larger laboratories (over 30 beds) generally do not require the SMAC service. These hospitals do require many of the other services of the Provincial Laboratory in serology, microbiology and radioisotope testing. A number of hospitals have complained to the Review about the turnaround times of these latter services.

The Provincial Laboratory produces impressive volumes of work. It is very much a mass-production institution. Performing tests on inadequate specimens is not productive - yet, to start selection would be impractical in such an operation. Test results that reach the physician long after the patient is discharged should be regarded as a waste of resources. An almost universal complaint that endocrinology test results do not fit the clinical presentation, should be reviewed.

This laboratory instituted a quality assurance program (PAS) which at inception performed well. In the last few years it appears a token effort at quality control. This is mainly due to underfunding, along with no real overall plan or means of follow-up.

The laboratory does have expertise in toxicology and parasitology and acts as a referral centre for special microbiology. Its function in the Public Health field is invaluable.

3. OTHER CENTRALIZED REFERRAL LABS

The Pasqua Hospital provides a central Pap cytology service for the Province. It functions well; clinicians are satisfied with the reports and the follow-up that this provided. With the aid of a computer, this service will be even better in the future. This laboratory provides all the necessary services to the Cancer Clinic in Regina.

University Hospital is capable of performing almost all of the clinically relevant testing that is necessary in the province. It has a virology department, for example. It does act as a referral centre to a few (5) small hospitals. The physicians are pleased with the service. They also isolate and identify tuberculosis bacteria as does the Provincial Laboratory. However, it is the only centre in Saskatchewan that does the sensitivities on these organisms. The University Hospital provides all the necessary laboratory work for the Cancer Clinic. It also provides the highly specialized histo-chemistry that is so important now in cancer (leukemia) identification and classification.

4. PRIVATE LABORATORIES

4.1. Overview

Private laboratories serve outpatient, ambulatory care patients during, or immediately after, visits to the doctors' offices.

They primarily provide a convenience factor to patients in the larger cities. All of the main pathologist-supervised laboratories are located in doctors' office buildings or adjacent thereto. Physicians' office laboratories are part of their offices, of course. Some of the pathologist-supervised laboratories also have small "specimen collection centres" or satellite laboratories within or near physician offices, which channel specimens to the main laboratories.

There is one private laboratory in Prince Albert and one "specimen collection centre" in Moose Jaw. The other pathologist-supervised laboratories are located in Regina and Saskatoon. The largest single factor promoting the establishment of these laboratories is, we believe, service to the patient. The Base hospitals are generally located some distance from physicians' offices. They are inconvenient to reach, and have poor parking and facilities for the "routine" outpatient. Their funding has not encouraged them to encourage outpatients and in fact, most of the Base hospitals discourage routine outpatients. In Regina, the Provincial Laboratory strictly accepts the referral of specimens only; it has no capacity to receive outpatients. Thus the only real options left for most physicians (if they want to keep their patients) are to take the specimens and deliver them to the public laboratories (which is inefficient and very inconvenient, especially for hematology tests which should be done quickly); do the majority of the tests on-site; or, direct the patients to a nearby private laboratory.

Some private laboratories will have couriers pick up specimens from the physicians' offices, if they are not conveniently close to the lab. A few private laboratories also provide phlebotomy services for nursing homes, etc. This is very cost-effective compared to the options (i.e. if the senior citizen must be escorted and driven to a laboratory in an ambulance or taxi).

Physicians bill MCIC according to three Lists of fees. List 1 includes 20 tests and List 2 has 23 tests (three additional to List 1). List 2 laboratories require the employment of RT or CCT. Pathologist-supervised laboratories bill under List 3, which includes 87 procedures over and above List 2.

The following table summarizes the growth of the number of private laboratories between 1978 and 1983/84.

NUMBER OF PRIVATE LABORATORIES

LOCATION	LIST 1		LIST 2		PATHOLOGIST	
	1978	1983/84	1978	1983/84	1978	1983/84
Regina & Saskatoon	108	134	12	23	3	4
5 Other Cities*	47	58	3	6	0	1
All Other Locations	149	145	8	13	0	0
Total	304	337	23	42	3	5

Source: MCIC

* Five other Cities are Moose Jaw, Swift Current, North Battleford, Prince Alberta and Yorkton.

4.2. Pathologist-Supervised Private Laboratories

The private laboratory usually encompasses a system of delivery of laboratory services to outpatients. This may involve bleeding stations or satellite laboratories located in strategic places adjacent to doctors' offices. Couriers or taxis are employed for pick-up of specimens and delivery of reports. Their turnaround times are as good as, and in many instances much better than, those provided by the hospital or Provincial Laboratories.

The data obtained from MCIC indicates a 44% increase in work-load from 1978 to 1983-84:

SERVICES	1978	1983-84	% INCREASE
By Department:			
Biochemistry	402,278	658,251	63.6%
Blood Bank	2,448	3,718	51.8
Hematology	256,992	272,979	6.2
Microbiology	83,810	102,629	22.4
Specimen Collection & Referral	56,871	123,265	116.7
Total Services	821,761	1,184,975	44.0%

Examination of this data reveals specific reasons for the increase in testing overall:

Biochemistry

BIOCHEMISTRY SERVICES	1978	1983-84	DIFFERENCE
Biochemical Panel	0	190,742	
Hycel Panel	10,254	0	180,488

Biochemical panels were introduced to the fee schedule as private laboratories acquired semi-automated profiling equipment.

BIOCHEMISTRY SERVICES	1978	1983-84	DIFFERENCE
T3 Uptake	8,596	24,875	16,279
T4	17,948	32,157	14,209

Both T3 and T4 tests are in high demand in Medicine due to medical indications. The slow turn-around time due to 'batching' by some laboratories has encouraged physicians to seek better service.

BIOCHEMISTRY SERVICES	1978	1983-84	DIFFERENCE
Glucose Tolerance	227	6,126	5,899

This test is used to make or confirm the diagnosis of diabetes. The patient must be in the laboratory from 2.5 to 4.0 hours. Hospitals in Regina and Saskatoon do not encourage such out-patients.

These 4 procedures, out of a total of 49, accounted for 253,900 tests in 1983-84, compared to 37,025 in 1978. If these are removed from the totals, the overall growth in clinical chemistry tests increased by 10.7%

Blood Bank

There is one test out of a total of six, namely cold agglutinins, that accounts for the major increase. Medical practice recognizes the importance of these products in disease - a medical advance. A total of 1,978 tests were performed in 1983-84, compared to 60 in 1978. Removing this one test out of 6 in the fee schedule shows an increase of 9.19% in this section.

Hematology

No abnormal variations were noted in this section. Total hematology tests increased 6.22%.

Microbiology

Of all laboratory tests performed in Saskatchewan, those in microbiology receive the most criticism. Physicians cannot rely on the results if specimens must be handled at a distance. Infections are one of the leading causes of morbidity in patients and hospital admissions. Microbiology should be done as close to the patient as possible. Private laboratories appear to do this job well and as a result, attract work from physicians. This seems to account for the marked increase in routine cultures and antibiotic sensitivity work in the private sector.

BIOCHEMISTRY SERVICES	1978	1983-84	INCREASE
Routine Cultures	38,780	51,815	13,035
Antibiotic Sensitivity	7,350	14,952	7,602

Candida infections have been recognized as a cause of many infections. A new procedure (not available in 1978) has now become useful in isolating this yeast. Its increase is a result of medical necessity.

MICROBIOLOGY SERVICES	1978	1983-84	INCREASE
Chlamydospore Prep. for Candida	26	7,775	7,749

Chlamydia is an agent responsible for sexually transmitted infection. It, too, has been identified as a cause of disease in only the last few years. The data on these tests will appear shortly. To date, there has been a resistance to allowing private laboratories to perform this test.

In 1978 world travel was not as common as today, nor was immigration of "third world" citizens. This has changed. Exotic and common place parasitic diseases, seldom seen before are now a part of a physician's differential diagnosis. This probably accounts for the marked increase of stool examinations for parasites.

MICROBIOLOGY SERVICES	1978	1983-84	INCREASE
Stool Examination for Parasites	1,291	6,776	5,489

When these four tests are removed from the total of 17 in the fee schedule, the pathologist-supervised laboratories have decreased their overall amount of testing in the microbiology section.

MICROBIOLOGY SERVICES	1978	1983-84	DECREASE
Microbiology (Net)	36,363	21,311	41%

Specimen Collection & Referral

This is a task that is not peculiar to the private laboratory. Someone must obtain the patient's specimen, document it and if necessary forward it onto a reference laboratory. The physician in his office or the private laboratory, or the hospital must do this work. The hospitals, as noted previously, have shown reluctance to do this type of work in the major cities.

Therefore, this item should not be identified specifically with an increase in the private laboratory sector.

Summary

If one compares the pathologist-supervised laboratory data as previously issued, the following shows the total effect of the modifiers:

SERVICES	1978	1983-84	% CHANGE
Total Laboratory Services	821,761	1,184,975	44.0 %
Eliminate Specimen Collection	- 56,871	- 123,265	
Total	764,890	1,061,710	38.8 %
Biochemistry (4 tests eliminated)	365,253	404,351	10.7 %
Blood Bank (1 test eliminated)	2,448	2,673	9.2
Hematology (none eliminated)	256,992	272,979	6.2
Microbiology (4 tests eliminated)	36,363	21,311	- 41.0
Adjusted Total	661,056	701,314	6.08%

The pathologist-supervised private laboratories have shown an increase in their work-load. As outlined, the total increase of 44% is considered largely due to factors such as advances in medical knowledge, better service and providing services that are obtainable with great difficulty in the public sector. An adjusted total of 6.08% appears to be a reasonable level of increase.

Private laboratories are supervised by pathologists. Other physicians can and do have ownership in some of these laboratories, and these physicians do refer their patients to their own laboratories for an extensive array of tests. This "self-referral" is definitely an area of potential conflict of interest for such physicians. There is no proof, however, that laboratory-owner-physicians in Saskatchewan have over-utilized their facilities in pursuit of profit.

Generally, the owners and pathologists of these laboratories are dedicated in their attempt to provide good service to the patient and a rapid answer to the attending physician. One, for example, has expressed in his Brief to the Review the opinion that each laboratory should be prepared to negotiate remuneration relative to volume. It is recognized that with a fixed fee for each test, volume can distort the payment. If fees are set to cover the costs of the high volume laboratory, this would effectively curtail the smaller facility. Or, if the fee is set for the smaller laboratory, this will result in a windfall for the larger laboratory.

4.3 Physicians' Office Laboratories

Many physicians have found that a few tests performed in the office, while the patients are still present, give swift answer in aide of diagnosis and treatment. The patient is spared the inconvenience or hardship of proceeding to another private or hospital laboratory.

A major point of controversy during the Review has been whether or not physicians should perform tests in their offices from the standpoint of quality control. Another aspect of the debate has been that if the doctor should perform in-office tests, just what procedures should he or she do. That is, at what point is a physician running a laboratory in addition to serving his patients?

This concern relates primarily to the establishment of List 2 laboratories under the MCIC fee schedule. While List 2 provides for only an additional three procedures, it does require that the physician employ an R.T. or C.C.T. The number of List 2 laboratories has increased from 23 to 42 in the past five years, while List 1 laboratories have increased from 304 to 337. It would appear that between 1978 and 1983/84, there has been some relative incentive to establish List 2 facilities relative to List 1.

That incentive does not lie in the number of tests the different laboratories are allowed to perform. The three additional tests are an almost insignificant part of the total:

Number of Tests	1978	1983/84
30V Blood Sugar - Chemical	27,448	44,687
146V Cholesterol - Chemical	12,643	15,664
147V Cholesterol - Serum	0	2,255

It appears that increasingly physicians are deciding to hire professional laboratory personnel, and thus qualify for List 2. The addition of technologists, in turn, requires that a minimum number of tests be performed in order to pay this employee's salary. The average List 1 laboratory performed 2,373 services in 1983/84, compared to 10,581 in the average List 2 office.

While the number of office laboratories per physician has actually fallen by five percent throughout the province, the number of office tests per physician has grown considerably faster than the utilization of other laboratory facilities.

LOCATION	NUMBER OF IN-OFFICE TESTS PER PHYSICIAN		
	1978	1983-84	% CHANGE
Regina & Saskatoon	1,197	1,391	16.2%
5 Other Cities	1,897	2,180	14.9
Other Locations	1,294	1,413	9.2
Total	1,339	1,537	14.8%

Twice as many rural physicians have office laboratories than those in Regina/Saskatoon, and this probably reflects the availability of pathologist-supervised laboratories in those cities. The urban physicians have established their own laboratories at a faster pace than their rural colleagues, however, and are increasing their utilization of them more quickly. One possible reason for this is that, in Regina especially, physicians located in suburban shopping centres are not serviced by bleeding stations of pathologist-supervised laboratories.

The reviewers sought a consensus on what procedures were appropriately performed in the office laboratory while the patients waited for the results. We cannot say a consensus was reached, but we believe the majority of physicians consulted agreed there was no need for the procedures to exceed the following; blood sugar, urinalysis (complete), pregnancy test, hemoglobin, trichomonas identification, and mononucleosis.

Beyond that list of tests we believe the physician is running a private laboratory as an adjunct to the practice of Medicine.

5. Satellite Laboratories and "Specimen Collection Centres"

A specimen collection centre, often referred to as a "bleeding station" is located close to doctor's offices. This allows easy access for the patient. Appropriate documentation is done, and the specimen is taken from the patient. The specimen is suitably prepared and packaged and then sent to the laboratory.

Usually a courier service is provided which picks up specimens as well as delivers test results. The specimen is then tested in the laboratory.

Some of the laboratories, including at least one Base hospital, provide phlebotomists who travel to nursing homes to obtain specimens which, in turn, are taken to the laboratory. These perform similar functions to the stationary collection centre.

The "satellite laboratory" is essentially a specimen collection centre having the ability to perform a few tests. The tests usually are those of hematology, and possibly urinalysis. Some may have basic biochemistry capabilities. The laboratory can be of any size or volume - demand and expediency are the limiting factors.

Since satellite laboratories are, in fact laboratories, they should be supervised commensurate with the scope and volume of work. Bleeding stations require minimal supervision, similar to that required for "mobile phlebotomists".

COSTS

1. TOTAL COSTS IN 1983/84

One matter of considerable interest in the Review has been the total cost of clinical laboratory services, and the "real" cost of the public sector laboratories in particular. The table below summarizes our calculations. Details of costs and methodology are provided in Appendix H.

TOTAL COSTS OF CLINICAL LABORATORY SERVICES
IN SASKATCHEWAN FOR F.Y. 1983/84

LABORATORY SECTOR	COSTS	PERCENT OF TOTAL COST
Hospital Laboratories (by Approved Daily Census)		
ADC 0 - 14.9 (72 Hospitals)	$ 2,554,579	4.6
ADC 15 - 24.9 (31 Hospitals)	2,717,760	4.8
ADC 25 - 49.9 (10 Hospitals)	2,242,724	4.0
ADC 50 - 100 (7 Hospitals)	2,631,504	4.7
Regionals (7 Hospitals)	8,164,636	14.5
Base (5 Hospitals)	16,263,218	29.0
University	7,686,778	13.7
Subtotal - Hospital Laboratories	$ 42,261,199	75.3
Physicians' Office Laboratories	$ 4,406,585	7.8
Pathologist - Supervised Labs.	4,799,513	8.5
Provincial Laboratory	4,677,485	8.3
Total	$ 56,144,782	100.0%

As noted in the Appendix, the calculations above have incorporated an "opportunity cost" for laboratory space and equipment. This was done to approximate total costs more closely with those in the private laboratories. While the resulting figures are not strictly comparable with the government's budgetary expenditures, the $56 million cost of laboratory services approximates 5.8% of the Department of Health's expenditures in fiscal year 1983/84.

It is tempting to divide the total costs of each hospital group with the number of Units they recorded to determine which is the "cheapest" on average. This is impossible on a test basis since we do not have a record of all the tests (or services) performed in the hospital sector. The results are not very meaningful on a total cost per Unit basis either, unless the laboratories are very similar in the mix of tests they perform. Not surprisingly, the cost per Unit in the hospitals under 50 ADC is very close. As all the other laboratories differ, so do their costs per Unit vary, increasing with size, sophistication and scope.

2. THE GROWTH OF LABORATORY COSTS

The growth of costs in the laboratory sector has been of greater concern than the total costs. While the sector as a whole currently represents only between 5 and 6 percent of the total health bill, the experience in other jurisdictions suggests that proportion can double in the space of a very few years.

In this section we examine the growth of laboratory costs over the five year period 1978/79 to 1983/84. To the extent possible, we have tried to determine the major causes of cost escalation in the different laboratory sectors. Data limitations have not allowed the aggregation of the various sectors. For example, it is not possible to determine a "fixed cost" component in 1978/79 for the hospitals and the Provincial Laboratory. Since fixed costs represented only about 16% of the total in 1983/84 this is not a major limitation to the analysis.

2.1 Hospital Laboratories

Since we were unable to determine values for hospital fixed costs in 1978/79, it is not possible to calculate the increase in total costs over the five year period to 1983/84. Actual figures are available for the other costs, however, which represent over 80% of the total. Hospital administration, plant and housekeeping costs have been apportioned according to the percentages derived in Appendix H(1).

HOSPITAL LABORATORY COSTS

LABORATORY COSTS	EXPENDITURES F.Y. 78/79	EXPENDITURES F.Y. 83/84	83/84 COSTS IN 1978 $	PERCENT REAL GROWTH
Lab Salaries (non-medical)	$ 9,254,843	$20,232,682	$13,029,847	40.8%
Supplies & Expenses	2,513,044	5,540,217	3,567,900	42.0
Subtotal	$11,767,887	$25,772,899	$16,597,747	41.0%
Admin. & Overheads	3,864,091	7,474,851	4,813,804	24.6
Employee Benefits	539,398	1,401,774	902,742	67.4
Total	$16,171,376	$34,649,524	$22,314,293	38.0%

Sources: AR-1's, 1978/79 and 1983/84; Appendix H(1)

The table above clearly demonstrates that laboratory salaries and supplies were the major contributors to the growth of hospital laboratory costs. The real growth in salaries paid results from a combination of an increase of 21.6% in the hours worked in the laboratory, and a 15.8% increase in the real wage level (after inflation) per paid hour.

(Full-time positions in the lab did not contribute much to the escalation, as permanent jobs increased from 650 to only 658. Part-time positions mainly covered the increased workload, increasing from 116 to 278).

The hours worked in the laboratory correspond quite closely with the increase in the number of tests performed in the hematology and biochemistry sections (once the University Hospital's unusual situation in biochemistry is removed). The number of tests increased by 20.6% compared to the total hours worked increase of 21.6%. In microbiology, a relatively labour-intensive area, workload Units increased by 24.1%.

Thus, while it is impossible to say with complete certainty what caused the increase in hospital laboratory costs, it would appear that volume, combined with real salary increases and inflation in the cost of supplies are the fundamental reasons.

2.2 The Provincial Laboratory

The table below summarizes the growth of costs in the Provincial laboratory. It appears the real growth in costs of 18.5% can be attributed almost entirely to rising real salaries. The staff increased by two positions over the period, or just over two percent. Data from the Provincial Laboratory indicates that its laboratory staff achieved real salary increases almost identical to their colleagues in the hospital sector (about 15.8%).

PROVINCIAL LABORATORY COSTS

COMPONENTS	EXPENDITURES F.Y. 78/79	EXPENDITURES F.Y. 83/84	83/84 COSTS IN 1978 $	PERCENT REAL GROWTH
Salaries	$ 1,412,056	$ 2,598,116	$ 1,673,187	18.5%
Other Expenses*	847,133	1,367,524	880,685	4.0
Total	$ 2,259,189	$ 3,965,640	$ 2,553,872	13.0%

Sources: Government of Saskatchewan Public Accounts 1978/79 and 1983/84. Includes the entire Provincial Laboratory, including the environmental section

* Includes purchases of capital equipment and some overheads, such administration.

Over the same period, biochemistry tests rose by 17.7 percent (workload Units decreased 30 percent), microbiology specimens increased 10.5 percent (workload Units increased by 25 percent) and environmental tests increased by 90 percent (workload Units increased by about almost 11 percent). This is a remarkable record of cost-containment.

2.3 Pathologist-Supervised Laboratories

The free-standing, privately-owned, pathologist-supervised laboratories have grown less quickly than the physicians' office laboratories but, we believe, faster than the public sector. The following table summarizes the payments made to these laboratories under List 3 of the MCIC fee schedule.

PATHOLOGIST-SUPERVISED LABORATORIES - COSTS

	PAYMENTS FOR TESTS/SERVICES				
	1978	% TOTAL	1983/84	% TOTAL	% CHANGE
Biochemistry	$ 841,299	49.4	$2,416,934	50.4	187.3%
Hematology	584,908	34.3	1,103,947	23.0	88.7
Microbiology	220,328	12.9	1,056,891	22.0	380.0
Specimen Referral and Collection	56,280	3.3	221,739	4.6	294.0
Totals	$1,702,815	100.0	$4,799,513	100.0	181.9%

Costs have increased due to a combination of volume and fee increases. The number of services performed increased by 33.4% over the five-year period, and the average fee per service, after discounting for inflation, rose by 35.9%. This latter figure corresponds very closely to the real increase in the cost of labour and supplies in the hospital sector.

2.4 Physician Office Laboratories

This sector has experienced the most dramatic increase in costs. The following table summarizes the payments made to physicians under Lists 1 and 2 of the fee schedule.

PHYSICIAN OFFICE LABORATORIES - COSTS

	PAYMENTS		
SERVICES	1978	1983/84	% CHANGE
Biochemistry	$ 560,517	$2,077,278	270.6%
Hematology	466,261	1,773,842	280.4%
Microbiology	10,593	104,315	884.8%
Specimen Referral and Collection	221,793	451,151	103.4
Total	$1,259,164	$4,406,585	250.0%

Costs have risen due to a combination of increases in volume and fees and, apparently, in the mix of tests performed.

The total volume of services increased by 38.8% over the five year period. The average fee per service, after discounting for inflation, rose 63.0%. To an extent, there was a shift in work performed on-site towards the higher cost tests on the fee schedule.

Three tests accounted for 64% of the total payments to physicians in 1983/84 - the Blood Profile, Urinalysis, and Haemoglobin. The same tests accounted for 53% of the total in 1978/79. The Blood Profile (including Haemoglobin, W.B.C., Smear and Differential) accounted for the greatest growth. With a fee of $9.70 in 1983/84, payments over the five year period grew from $30,389 to $669,620 per annum.

3. COST COMPARISONS

The increase of costs in the laboratory field were compared with increases in the costs of other hospital services, such as radiology and other diagnostic procedures, and with hospital total operating expenses. The increases in cost "per service" of private laboratories was also compared with the increases of many other physicians' services under the MCIC fee schedule. In all the cases examined, within their respective sectors, the increases in laboratory costs exceeded those of other medical services (see Appendix H).

There is no doubt that volume, wage, supply and fee costs escalated rapidly in the laboratory field, at least in the early years of our five-year study period. There is no reason to conclude that similar cost escalations will continue, although they certainly bear watching. The intracicies of attempting to analyze the cost increases of all the other diagnostic services was clearly beyond the scope of the Review, and probably fruitless as well. Without dissection of all the other fields, however, it is not meaningful to try to compare "services".

The other major issue which arose concerning costs was the relative cost of the private sector laboratories and the public laboratories. Here again, a direct comparison is virtually impossible because of the widely different scope and volume of services provided in each laboratory in the province. In addition, the MCIC fee schedule, while it is an absolute measure of the costs of private laboratories to the paying agency, does not necessarily reflect the actual monetary costs incurred of performing a specific test in a specific laboratory.

The argument over public versus private laboratory costs must be reduced to the theoretical. Given the importance comparative costs received during the Review, however, we feel we should put forward our conclusions. As with any theoretical proposition, of course, this requires a number of simplifying assumptions.

Since most laboratory procedures are subject to economies of scale in production, the average cost per test will decline with volume. Fixed costs, such as building space, taxes, and equipment remain almost constant anywhere from one to thousands of tests. Variable costs rise unevenly

with each test performed. The cost of reagents per test rises almost in proportion to the number of tests, although volume discounts can greatly reduce this element. Direct labour costs (i.e. technologist), the largest single cost component, jump unevenly. Up to a certain point in volume they will be constant, and decline per unit of volume. Then if an additional shift or overtime is required, labour costs can jump faster than the incremental number of tests performed. Overheads such as administrative costs (i.e. supervision, building operation, etc.) are relatively fixed until major volume thresholds are reached - then they usually expand considerably.

Given the same volume and similar equipment, however, any laboratory should perform a specific test for close to the same cost. That is, the average cost should be about the same per test.

The incremental, or variable costs can differ widely from the average cost, however. For example, machine X can handle 50,000 specimens per year, allowing for regular maintenance. The cost of the machine is basically the same whether 50,000 or 20,000 specimens are put through it. The same applies to the building space, heating and lighting, etc. Machine X may be cost and quality-effective, compared to manual methods, even if only 20,000 specimens are processed. Thus many laboratories have "overcapacity" in their automated and semi-automated equipment.Similarly, a number have space that is necessary for present volumes, but can handle much greater ones at no additional cost.

The paying agency or agencies cover the public sector laboratory's total costs. If the public laboratory has excess capacity and performs additional tests, it will only incur additional variable expenses. A low number of incremental tests may involve expenditures only for extra reagents, documentation forms, sample cups, etc. A higher number of extra tests may require additional staff time. Eventually, of course, capacity of the fixed factors of production will be reached, and the additional costs will include more equipment, building space, and administrative overheads.

The fee paid to private laboratories, however, is fixed regardless of the number of tests performed. The calculation of the fee presumably includes coverage of all fixed and variable costs, assuming a specific volume of tests are performed. Since most private laboratories are in physicians' offices, the volumes assumed are probably quite low for the 23 procedures in List 2, regardless of where they are performed.

If the private laboratory performs fewer tests than the number assumed in the calculation of the fee, it will not recover its total costs (or, at least will not make a full profit). If it exceeds the number of tests assumed in the fee calculation, however, it will make "excess profits". It will continue to receive the contributions in the fee to fixed costs and overheads but, until it reaches the outer capacity of these fixed factors, it will not actually incur those costs.

In a truly free-enterprise competitive market the private firms would reduce prices in order to attract business and pass along the savings of greater volume to the consumer. Since the fees are fixed, however, the private laboratory captures all the benefits of increasing its volume past the "breakeven point" that exists somewhere in the fee for each test.

Thus there is no doubt in our minds that if the public laboratory is built for a relatively large throughput of tests, and has extra machine or space capacity, it will provide a potentially large incremental number of tests for less public expenditure than the private laboratory under a fixed fee schedule.

The most extreme example of this we could find, for illustrative purposes, was the biochemistry panel. If an outpatient leaves a blood specimen at a pathologist-supervised private laboratory, and ten or more tests are performed on it, the fee is $18.20. This figure represents both the average cost, and the incremental cost to the paying agency.

Information from the Regina General Hospital reveals a considerably different picture. The incremental cost is $1.04 when performed on its SMAC. To that amount must be added the specimen collection and documentation costs of $3.00 to $4.00 if the patient had actually arrived at the RGH's outpatient department.

The biochemistry profile is probably the most extreme example of the differences in incremental costs, but the principle applies to all tests.

RECOMMENDATIONS

INTRODUCTION

The current laboratory system serves Saskatchewan reasonably well. We believe, however, that there is room for improvement, and that a number of changes are required if the objectives for laboratory medicine in the province are to be furthered.

The current roles of some of the laboratory sectors should be changed--some quite significantly. Service can be improved, especially outside Regina and Saskatoon. The system can be more cost-effective over the medium-term, although this may require additional expenditures in the short-term. The system needs more formal organization and better communications if it is to function effectively, and it requires a legislative framework to bring this about.

The recommendations have been grouped according to subject, in the following order:

Quality Assurance
Standards
Licensing
Decentralization of Referral Laboratories
Hospital Outpatient Services
Private Laboratory Remuneration
Utilization
Laboratory Manpower

QUALITY ASSURANCE

Recommendation 1: The Province should develop and implement a comprehensive, province-wide quality assurance program as the first step towards the improvement of laboratory services.

Quality control of diagnostic laboratory testing should be fundamental to the province's laboratory system. Incompetent testing can be dangerous to patients' welfare and is a waste of taxpayers' money. We are satisfied that the majority of tests performed in Saskatchewan are competent. No one can be sure of that, however, in the absence of a quality control program.

The quality control program should, in legislation and regulations, specify quality control procedural guidelines for application within every laboratory in the province. In addition, it should require the participation of every laboratory in a provincial external quality assurance program for every test the laboratory performs.

Quality assurance must be monitored and enforced. A regulatory body must have the legislative authority to force laboratories to stop performing tests that fail to meet standards. It should be explicit that laboratorians are legally liable if they disregard the legislation and regulations.

The purpose of a quality assurance program is not, of course, to find fault or to punish. The program must contain a strong educational component, whereby laboratorians who do not meet the standard are provided every reasonable opportunity of improve their test results.

We believe a comprehensive quality control program will not only improve the practice of laboratory medicine in Saskatchewan, it will also mitigate a wide variety of the issues that were raised during the Review process.

One issue is financial. While the program may cost several hundred thousand dollars to maintain each year, we believe it would save as much as it would cost. Based on the experience of other provinces, the range of tests will be reduced in many laboratories, eliminating the need for equipment, supplies and space. These laboratories will not meet quality control standards because they perform an insufficient volume of tests and thus the resources they devote to them are very underutilized. In addition, new tests will not proliferate at the whim of individuals.

There should be no reason for hospitals to repeat the tests of new admissions. This appears to be an almost universal practice at present. In addition, the number of repeats requested by physicians should decline.

We believe the quality assurance program should utilize existing Saskatchewan resources where it is appropriate and cost-effective. It should involve three major groups in its development and ongoing operation: The College of Physicians and Surgeons of Saskatchewan; the Provincial Laboratory; and, senior laboratory technologists under the supervision of pathologists in the province's hospitals.

Please note the detailed outline of a quality assurance program kindly prepared by Dr. Stephen Harold, President of the Saskatchewan Society of Clinical Chemists, as a possible model for the operation of the program. (Appendix J)

Recommendation 2: The College Physicians and Surgeons of Saskatchewan should direct, monitor and judge the compulsory quality assurance program.

The College, as part of its mandate, must be assured that the practice of medicine is of a high standard in Saskatchewan. Laboratory medicine should be part of that mandate.

The program would be directed, on a daily basis, by an assistant Registrar of the College. Initially two, and perhaps later one senior laboratory technologist would provide the permanent staff. The role of the staff would be to monitor and investigate quality control reports, and to assist in the development of standards.

A committee of the College would examine problem areas, recommend remedial actions, and recommend disciplinary actions to the College. The committee should include at least the following:

a general pathologist
an anatomic pathologist
a biochemist
a microbiologist (with expertise in infectious diseases)
a senior official of Saskatchewan Health (as observer)
a member of the lay public.

Another important task would be to review the current test "menu" provided in Saskatchewan laboratories. The College should have the ability to eliminate obsolete tests, technology or methods.

It should examine the proven medical relevence of new tests and the advisability of their introduction to the "menu." New tests still in the investigative stages of their medical need should be regarded as a research and development projects best performed by the Provincial Laboratory or possibly the University Hospital.

Recommendation 3: The College of Physicians and Surgeons should have the legislative authority to approve or deny the establishment of new laboratories, or the addition of tests or procedures by all existing laboratories, on the basis of competence.

Since the College would be responsible for the quality of laboratory medicine, it must be convinced that staffing, equipment, procedural methods, etc., are capable of performing tests competently.

This will require, initially, an inventory of all the tests performed in all the laboratories in the province and approval of them. It will then maintain a record of all the tests certified or deleted from the approval list of each laboratory.

Recommendation 4: The Saskatchewan Red Cross Blood Transfusion Service should become an active member of the compulsory quality control program.

The Canadian Red Cross is providing guidance and teaching to the laboratories that provide transfusion services.

Co-ordinating its program with the compulsory program has much merit and much agreement.

Recommendation 5: Physicians' office laboratories which perform only a specific "short list" of procedures during the office examination of a patient should be exempt from the compulsory quality assurance program.

The following procedures are recommended for exemption on the basis that no physician should be unduly influenced in his treatment of patients by the results of the tests alone:

hemoglobin
blood sugar
urinalysis
trichomonas
mononucleosis
pregnancy.

Recommendation 6: The Provincial Laboratory should assume responsibility for the daily operation of the provincial quality assurance program.

The Provincial Laboratory is the most logical institution to provide the administrative and technical functions necessary to the operation of the program. Whether the Provincial Laboratory prepared and distributed its own quality control samples or co-ordinated the uniform introduction of existing programs, (such as the CAP--College of American Pathology--for the larger hospitals, and the CAP's EXCEL program for smaller laboratories), it should compile all the data and prepare reports for the College of Physicians and Surgeons.

In brief we envision the program operating as follows:

- the Provincial Laboratory compiles the quality control reports and notes those laboratories out-of-controls
- copies of hospital reports are provided to "quality control" technologists in the (new) regional hospital laboratories
- the technologist discusses the problem by telephone with the laboratory concerned
- if the laboratory is out-of-controls a second month, the regional technologist visits the laboratory concerned and prescribes corrective measures
- if the laboratory is out-of-controls a third month, the Provincial Laboratory would recommend to the College that certification for the test be suspended pending an investigation by its quality control staff and/or the staff of the College
- the pathologist-supervised hospitals and all private laboratories would be regulated directly by the Provincial Laboratory, although the steps would be basically the same
- the Provincial Laboratory's quality control should be directly subject to the regulation of the Committee of the College.

An annual fee per laboratory and per licensed test would be levied by the Provincial Laboratory to fully cover the cost of the program.

STANDARDS

Recommendation 7: Minimum provincial standards for all diagnostic laboratories' facilities and operations should be established.

There are currently no consistent provincial standards for laboratories in Saskatchewan. Standards are important for quality testing, efficient operating procedures and the safety of laboratory staff, other workers and the public. Since many standards relate directly to laboratories' internal quality control procedures, they should be developed in cooperation with the Quality Assurance Program.

The standards should be sufficiently detailed to provide clear guidance to laboratory managers and regulators, but not be so detailed or restrictive as to unduly hinder compliance. The standards for premises, equipment and other matters should be suitable for the number and scope of tests the individual laboratory actually performs.

Examples of areas for which standards should be developed include:

Facilities: ventilation, environmental controls, space, fixtures (eg. lighting, bench tops).

Safety: protective clothing, safety hoods for microbiology, disposal of waste and hazardous materials, infection control.

Equipment and Maintenance: records of daily temperature readings of thermally controlled equipment, discarding of "out-dated" reagents, preventative maintenance, maintenance records.

Manuals: the use of manuals for safety, maintenance, quality control, technical procedure, specimen collection, policy.

Personnel: general definitions of the roles, authority and responsibilities, and minimum qualifications for various positions within laboratories, such as Director, Supervisor, Technologist and Technician.

LICENSING

Recommendation 8: All diagnostic laboratories and their ancilliary facilities, and each test or service provided by them, should be licensed and inspected by the Department of Health.

A system of licensing laboratories, and the scope of tests they perform, is both desirable and necessary in Saskatchewan for a number of reasons.

The users and providers of the laboratory system want quality assurance and standards. Some form of licensing is necessary if such programs are to be "enforceable".

Much concern was expressed about the different sectors' roles in the system. We have recommended some broad changes in the roles of the laboratories currently part of the system, but we have no doubt that within a few years such factors as changing technology, medical practices and demographic shifts will warrant re-examination of at least parts of the system. A forum is required for the monitoring, discussion and evaluation of further changes to the system on an ongoing basis.

The system is almost completely open-ended in terms of the number of laboratories established and the scope of tests they perform. Since all laboratory services in Saskatchewan are paid for from the public purse, the Government has the right and responsibility to ensure these funds are used effectively. More Provincial direction is required in the allocation of resources within the system.

Better management of the system requires a data base, and a licensing system, in conjunction with the Quality Control Program that can provide an up-to-date record of relevent information.

The licensing legislation should be administered by a Standing Committee of the Department of Health. Responsible to the Minister, its broad representation should include:

- senior officials of Saskatchewan Health (SHSP, MCIC, Provincial Laboratory)
- a general pathologist
- a practicing physician
- a hospital administrator
- a member of the lay public.

Some of the parameters the Committee might use as guidelines in deciding to issue licenses include:

a) is the new test or new laboratory going to provide a service that is not present in the immediate community, region, or in the instance of esoteric tests, in the Province.
b) are similar services in close proximity or readily available.
c) have patients, at present, reasonable access to equivalent services.
d) are lower-cost options available for the provision of a needed service.
e) are public funds available to provide for such new or additional services.

We envisage that the staff of a unit attached to the Provincial Laboratory would provide the necessary administrative and analytical support required by the Committee. This unit should also maintain licensing records and inspect laboratories for compliance with provincial standards and terms of the licences.

Applications for laboratories, tests or services should be filed concurrently with Saskatchewan Health and the College of Physicians and Surgeons, to minimize delay. Licences could only be issued after certification of "competence" by the College.

We cannot determine what an appropriate appeal procedure might be, but applicants should be allowed to re-apply for licenses.

The application of the guidelines--especially the "reasonableness" of current services to patients--should be interpreted with equanimity. Within reason, patients should not be penalized by their location of residence, transportation options, etc.

An unfortunate potential of licensing, whether intentional or not, is that it can preserve the status quo and indirectly create monopolistic markets. This is not in the interest of technological innovation, service to the public, or costs. We therefore believe that the licensing guidelines should be applied to encourage competition between laboratories, whether public or private, within reasonable bounds of cost-effectiveness.

DECENTRALIZATION OF REFERRAL LABORATORIES

Recommendation 9: Routine biochemistry and microbiology tests currently referred to the Provincial Laboratory should be referred to the province's pathologist-supervised hospital laboratories.

We believe the Provincial Laboratory has provided an excellent and necessary service in the evolution of the province's laboratory sector. It has provided a medical service, as a "mail-order" laboratory, that would not otherwise have been available to physicians outside Regina and Saskatoon. The Laboratory is very efficient, and has contained costs remarkably relative to other sectors.

Its routine services have been subject to considerable criticism during the Review. The causes for the criticisms are largely beyond the control of the Provincial Laboratory itself. The first is turnaround time. The primary cause of this is the mail system, but we doubt significant improvements could be effected throughout the province by the use of more expensive modes of transport. The root of other complaints seems to be the "batching" of tests in the laboratory. This delays the work, but we doubt other laboratories could afford not to batch most of their expensive tests. Other complaints relate to "service." These include mixed-up documentation, and a resistance to telephone abnormal results. Complaints about the SMAC generally relate to "missing" tests--that is, one or more channels were not functioning on the SMAC but the report was sent out anyway.

These kinds of complaints are indicative of a mass-production and impersonal kind of institution stretched to the limit of its capacity. While very small laboratories can be inefficient, there are limits to growth, as well. We suspect the Provincial Laboratory has reached the point where the sheer logistics of dealing with thousands of specimens every day has outstripped the capabilities of its physical and human resources. Improvements would require a major investment in new facilities, equipment, and additional staff.

We doubt expansion is in order, however, for a number of reasons.

First, it appears that the growth in the number of biochemistry tests is close to peaking as the rural physicians "catch up" to the urban doctors in their utilization of this section. In addition, there is considerable pressure for the smaller hospitals to introduce a wider range of clinical chemistry on-site. Certainly as the geriatric population increases, and the rural hospitals become more involved in its care, the local justification for electrolytes, cardiac enzymes, etc., will be enhanced.

Second, no changes to the Provincial Laboratory itself can deny that specimens would continue to travel great distances to reach Regina (or any one city where the laboratory may be located). The postal system is likely the only option for specimen transport--couriers and buses are much more expensive, are generally no quicker, and do not service the whole province. The consensus of the medical opinion in much of Saskatchewan is that, particularly in the field of microbiology, the uncontrolled environmental conditions and shipping time in mail trucks compromise the value and credibility of the results provided by the Provincial Laboratory. If a significant proportion of the work performed in the laboratory is, in effect, wasted--or entails external costs such as the prescription of inappropriate antibiotics--then the effectiveness of the laboratory can be questioned.

Third, we believe that the logistics of sending test results back to the hospitals or physicians is almost as difficult a problem as that of incoming specimens. Currently the mail is used exclusively for "hard copies" of reports. The cost and logistics of sending back thousands of results each day from one reference laboratory by other means are staggering. The integration of the Provincial Laboratory with each of its "clients" via telecommunications or computer would be extremely expensive not only within the central laboratory, but in the receiving offices. It would also not be cost-effective, since the majority of the Provincial Laboratory's tests are not required urgently.

Another factor that we feel is extremely important is the lack of technical and medical consultation provided to the hospitals below the "Regional" size. The current arbitrary and ad hoc means by which these medical institutions receive advice from "regional laboratory consultants" or "consulting pathologists" is inadequate. We do not believe the Provincial Laboratory could provide these services without major additions

to the technical and medical staff, and such a centralized staff could not cover the entire province efficiently or effectively. Also, because the Provincial Laboratory operates at a technical level so far above the rural laboratories, there could be considerable interpersonal communications difficulties.

De-centralization of routine biochemistry and microbiology referrals would mitigate these problems considerably. The Base hospitals could perform all the routine tests ordered by the rural hospitals. Some Regional hospitals do not have quite the required range or capacity, but could currently do 90 percent of the requirements. The acquisition of a substantial amount of referral work would improve the "regional" laboratories' critical mass, and allow them to improve the breadth and depth of their services. If the "regions" are designed on the basis of transportation flows as opposed to simple geographical proximity, the specimen shipping times can be reduced in most cases. If, as Mr. Bahr states in his letter (Appendix K), regional referral laboratories could pick up mail from postal stations in the evening, and perform the work overnight, turnaround times would improve considerably. Transport options are also more flexible in a smaller area, and modes such as laundry trucks could be used. The logistical problems of reporting results would be considerably reduced, and improved "professional" communication would be more feasible.

A map showing approximate possible "laboratory regions" based on transportation flows is included in the Appendix.

Recommendation 10: The Provincial Laboratory should alter its role as a non-routine reference laboratory and the University Hospital should increase its activity as a provincial reference centre.

As a corollary to Recommendation 8, we believe that effectiveness of the laboratory system will be enhanced if two laboratories share the role of the non-routine provincial referral centre for many esoteric tests, especially in the field of microbiology.

The "regional referral laboratories" in the southern half of the province--i.e. Yorkton, Regina, Moose Jaw and Swift Current--would continue to channel esoteric referrals to the Provincial Laboratory. The "regional referral laboratories" in the northern half of the province--i.e. North Battleford, Prince Albert, Melfort and Saskatoon--would direct the tests they cannot perform to the University Hospital.

The Provincial Laboratory would continue its public health and environmental testing functions. It should maintain the range of clinical tests it currently performs that are practical and feasible, although consideration should be given to centralizing endocrinology procedures to the University Hospital. Most of the endocrinologists practice in Saskatoon; this would also mitigate the concern of a number of physicians

that test results vary widely between the two institutions. Endocrinology is a difficult area for interpretation as it is, but two inconsistent laboratories make the establishment of a baseline very difficult for practioners.

The Provincial Laboratory would also considerably enhance its quality assurance, co-ordinative and educational functions as described under Recommendation 6.

Recommendation 11: Pathologist-supervised hospital laboratories should "contract" with smaller centres to act as their referral centres.

This recommendation is a corollary to recommendation eight. It is useful to expand upon the organization of the new referral centres, however, and to clarify our proposals for their roles.

A map of the regional referral centres is provided as Appendix K. The reviewers stress that the proposed regions are approximate only, and are not based on a thorough evaluation of the transportation systems. They are derived from the work of Mr. Bahr and Mr. Dempsey, together with the hospital questionnaire comments and interviews (see Appendix K).

The proposed regions and routine referral hospital laboratories are:

Northwest	-	Battlefords Union
North/North Central	-	Prince Albert Victoria Union
Northeast	-	Melfort Union
Central	-	University Hospital
	-	St. Paul's
	-	City (possible)
East Central	-	Yorkton Union
Southwest	-	Swift Current Union
South Central	-	Moose Jaw Union
Southeast	-	Regina General
	-	Pasqua
	-	Plains (possible)

In addition, there is potential for some "sub-regional" centres, such as Estevan, Weyburn, Moosomin, Assiniboia, Rosetown, Lloydminster, and Meadow Lake, but we have not evaluated whether this would assist or overly fragment referral patterns.

The purpose of decentralization is the improvement of service throughout the hospital sector. Small hospitals should maintain some freedom of choice, within reason, of their referral laboratory. Thus, a system such as "offset budgeting" should be implemented to encourage good service by the regional referral laboratories.

One potential benefit of the structure to rural physicians and hospitals is the involvement of the pathologist as consultant. The pathologist should visit each hospital at least once a year, and be available for consultation. The current referral pattern for histology specimens should conform to that for other specimens. The pathologist should comment on all applications for new tests, equipment or new laboratories within the "region" to the College of Physicians and Surgeons.

The regional consulting technologists should be senior people who work at least part-time "at the bench" in their own hospitals. They should be available at all times to provide advice and trouble-shoot for the smaller laboratories. Other functions should include:

- consultant to the technicians in smaller hospitals on methods, procedures, equipment, supplies and laboratory design;
- co-ordinate group purchasing and the maintenance of equipment and the stocking of supplies in the region
- relate to the Provincial Laboratory and follow-up on matters pertaining to the Quality Assurance program, internal quality control, and licensing of tests with the hospitals in their regions
- maintain records of all equipment in the region, and facilitate the purchase of used equipment
- make regular visits to the small hospitals, including education and information components
- provide regular educational seminars and wet workshops at the regional hospital
- rotate staff between the regional and smaller hospitals for training purposes
- assist smaller hospitals in obtaining staff for back-up, sick leave, etc.

Recommendation 12: The Provincial Laboratory in co-operation with the Saskatchewan Hospital Services Plan, and in consultation with others, should develop a plan for the reduction of microbiology referrals in the province.

The major priority in this regard is to increase the capacity of smaller hospitals, especially the 20 to 50 ADC size, to provide routine, basic microbiology procedures, such as Gram stains, on-site. While changing referral patterns from the Provincial Laboratory to regional referral laboratories will improve service, on-site testing in this section should assist even more.

First priority should be given to the more remote hospitals such as LaLoche, Ile a'la Crosse, Uranium City and Meadow Lake.

HOSPITAL OUTPATIENT SERVICES

Recommendation 13: Hospital laboratories should be funded in a manner which would enable them to improve routine outpatient services.

The Base and Regional hospitals generally do not seek local routine out-patient work. Their facilities are not convenient for many patients, and they are not large enough to accomodate an influx of out-patients. With restraint in global budgets, out-patient services are restricted in favour of inpatient services and other priorities. Physicians have the options of serving patients in private laboratories, particularly in the larger cities.

The net effect, of course, is that the cost of laboratory work is simply shifted from SHSP to the MCIC.

We believe that, generally, laboratory testing in large-scale public laboratories is less expensive than in private laboratories under a fee schedule. At any point in time, the incremental costs of adding tests to a public laboratory will be less than the fixed fee. This may not be true for all public laboratories at all times if they have reached the total capacity for a specific test due to equipment or space constraints.

Saskatchewan's hospital laboratories, especially the Regionals, are not large. They do not perform a great number of tests, nor a very wide range. They are generally well below the volumes which would fully exploit economies of scale.

At the same time the hospitals require outpatient volumes to improve their laboratory services, they are discouraging outpatient work.

Hospital laboratories on global budgets should be fully funded for outpatient laboratory work, preferably by segregating it on a "line-by-line" basis. In addition, where it can be demonstrated as cost-effective, hospitals should be funded for service improvements such as:

- satellite laboratories
- specimen collection centres
- specimen pick-up services
- mobile phlebotomy services

Hours of service by hospital laboratory outpatient facilities was a controversial matter with physicians during the Review. The hospitals should be required to maintain services to a "reasonable" hour--such as 6:00 p.m. or 10:00 p.m.--as agreed with the local physicians. A more appropriate funding mechanism, together with the volume generated by regional referrals, should make extended outpatient hours feasible in all centres.

Recommendation 14: The private pathologist-supervised laboratory, satellite laboratory, and bleeding station should continue to provide out-patient services in support of physicians in Regina and Saskatoon. Such facilities should only be licensed elsewhere where existing hospital facilities are unable to provide reasonable out-patient services for reasons of financial restraints, or inability to expand.

Regina and Saskatoon hospitals have not been prepared, for a variety of reasons previously outlined, to provide out-patient laboratory services. The private laboratories perform a very necessary function and should continue.

In cities and towns outside of the two larger cities, out-patient work is necessary for hospitals to maintain adequate volumes that will justify their present staff, equipment and space. A private facility, whether a full or satellite laboratory or bleeding station will reduce that critical volume with no real benefit to the patient or the community. However, if the hospital cannot provide reasonable out-patient services such as: adequate hours of operation to coincide with doctor's office hours; an out-reach service to patients if doctors' offices are physically far removed from the hospital; or be innovative and expand their scope of tests--then one should consider the alternative, namely private facilities.

PRIVATE LABORATORY REMUNERATION

Recommendation 15: Physician's Office Laboratories should continue to provide a limited scope of tests on their own patients which would allow immediate management. These would be performed for a lower fee schedule.

List I and List II procedures should be abolished for physician laboratories.

The following tests, when results are immediately available, are of great help in patient management: hemoglobin, urinalysis, pregnancy test, blood glucose (meter and strips), test for infectious mononucleosis, and trichomonas identification. Most physicians agreed with this list during the Review process. Tests for which results are not immediately available i.e. prior to patient departure, should not be done. Additions to the scope, assuming appropriate licensing approval is given, should require participation in the compulsory quality control program.

Since the volume will be low (confined to the physician's patients and no referrals) additional space, staff, and expensive equipment should not be required. This is not to be a profit-motivated service. Therefore, the fees should be set lower than those allowed for a private pathologist-supervised laboratory.

Recommendation 16: The fee schedule for private pathologist-supervised laboratories should be divided into professional and technical components.

The pathologist, a doctor with special training, is recognized as a specialist by the Royal College of Physicians and Surgeons of Canada (by examination) and in turn by the College of Physicians and Surgeons of Saskatchewan. In the role of consultant, the pathologist prepares signed consultation reports (e.g. surgical reports, bone marrow interpretation, etc.). For these, fee-for-service payment should be no different than for any other Saskatchewan-recognized specialist.

The pathologist, as a supervisor and administrator of a laboratory, does not review each test that is done. The responsibilities do increase with increased work-load, but not in the same ratio. For example, the pathologist will not likely increase his supervisory activity whether an instrument performs 50 tests a day or 250 tests a day.

Thus, rather than on a fee per test or laboratory service basis, the pathologist's private laboratory functions should be remunerated directly by MCIC, in the form of fees for private consultations in the laboratory field, and in the form of a negotiated annual amount for ongoing supervisory responsibilities.

The technical component of the fee should not include provision for the professional aspect.

Recommendation 17: The technical fee for any test, the actual cost of which benefits from economies of scale, should decline with increments in the volume performed by any laboratory or association of laboratories.

After reaching a volume which may be regarded as reasonably cost-effective, especially where automated or semi-automated equipment is used, the fee per test should decline to reflect the fact that overheads have been covered, and only incremental variable costs should be recompensed.

UTILIZATION

Recommendation 18: It is recommended that each hospital have a standing Laboratory Utilization Committee.

Regardless of size of hospital, it is important that the physicians have a forum to meet with the senior laboratory staff on a regular basis. At these meetings problems can be identified and solutions or compromises can be reached.

Quality control performance must be reviewed.

Where practical, and the size of hospital warrants, a peer review on laboratory utilization should be instituted.

This can be a natural forum for grievance procedures.

Routines can be discussed to achieve maximum benefit of proper utilization. Matters such as "stat" lists, list of specific tests with their "panic" levels, routine admission profiles and many others - would be defined.

Recommendation 19: It is recommended that requisition forms needed to order laboratory tests for outpatients be standardized for all laboratories in the province.

Numerous studies show that physicians prefer requisition forms that are arranged in a "menu", requiring check-offs to indicate the tests that should be done.

Some laboratories list all the tests that they perform, resulting in a very large "menu."

Other laboratories utilize equipment capability and their "menu" features SMA 12/60; SMA 6/60; SMAC; electrolytes, etc.

Some laboratories group tests as they apply to a specific anatomical organ such as cardiac profile; liver profile; kidney profile etc.

In most instances, it is a mixture of all methods. The form often reflects equipment capability rather than medical need.

Various studies strongly suggest that if requisition forms list a few of the commoner tests and the physician must identify the tests that are needed by writing them on the form, the utilization rate drops. This is effective but not popular with the physician (or with some laboratories).

In hospital practice, the use of ordering by organ profile has merit. Thus organ profiles along with a modest number of very common tests should represent their form.

Ambulatory patients usually present with complaints that are not, at first, readily identifiable of any specific organ.

The requisition should be standard for all outpatients whether to the hospital or the private laboratory or as a referred specimen. It should have all the necessary demographic information. There should be a pre-printed check-off type of list of a limited number of the commonest tests and a space to allow the physicians to add additional tests.

This requisition could be used in any future audit check. We suggest adopting a form similar to that used in Ontario. It has three copies; one is kept by the laboratory, one is returned to the ordering physician, and the third is submitted to the paying agency.

Recommendation 20: The MCIC, in co-operation with the College of Physicians and Surgeons should monitor physician laboratory utilization profiles.

The MCIC, through their payments to physicians or to private laboratories, should be able to identify the utilization patterns of each physician. With an appropriate data base profiles would be obtained. Marked variance from the peer group should be a reason to have the Joint Professional Review Committee review the case.

Over-utilization of laboratory services should be dealt with in a manner similar to that used in the over-utilization of any other medical service in the Province.

Recommendation 21: The College of Physicians and Surgeons of Saskatchewan should monitor possibilities of conflict of interest in those private laboratories that are owned and used by medical practitioners in a similar manner to that done with other sensitive areas.

Qualified medical practitioners (and/or their immediate family) have financial interests in private laboratories. These physicians can and do send their own patients to be served by these laboratories (whether in their offices or pathologist-supervised).

As in any private enterprise, financial success must be achieved. On the other hand, the physician uses the laboratory to help manage the patient.

If volumes are low, the financial viability may become questionable. This obvious potential conflict of interest should be monitored by the M.C.I.C. in their physicians profile assessment in co-operation with the College of Physicians and Surgeons of Saskatchewan. It must be noted that cases of abuse have occurred in other Provinces.

If abuses are found in Saskatchewan, serious consideration should be given to legislative provisions similar to those in The Pharmacy Act (S.61 and S.62), which would restrict ownership and control of private laboratories to pathologists.

Recommendation 22: The College of Medicine should continue to stress in its curriculum the proper utilization of laboratory services for both undergraduate and post-graduate medical students.

It is understood that the medical student, early in the training period, must understand the relationship of disease to function. The laboratory can show values of many biochemical and biological components that are changed by disease or are altered by therapy. In this training period there are expectations of gross over-utilization and these are accepted as necessary. However, later in the training, every test that is ordered should have a medical indication. Clinicians must avoid teaching the gamesmanship of "canaries in January" approach to clinical medicine. This leads to over-utilization and the subsequent selfrighteous expression "in case I miss something."

Students and clinicians must be made aware of the true cost of the tests that they order. They must understand that valuable resources should be used wisely since these resources are in short supply. Waste in one part of our health system deprives other areas.

Various elegant studies have been documented in the literature. They show that teaching the students of medicine is effective if it is on a continuing basis. A lecture or two, or a 3 month crash course has been shown to be ineffective .

The College, in its outreach teaching programs, should by example show its own restraint.

LABORATORY MANPOWER

Recommendation 23: A special committee should monitor the Pathology Manpower Situation. It should provide data and make suitable recommendations.

Pathologists provide both consultant and laboratory supervisory services. Apart from the large hospitals in Regina and Saskatoon, the other hospitals throughout the Province require General Pathologists or Anatomical Pathologists who demonstrate a broad knowledge in other fields such as biochemistry, microbiology, hematology etc.

A recent study prepared by Dr. Harry Emson of the College of Medicine shows many "greying" Pathologists within hailing distance of retirement in Saskatchewan.

In Canada from 1975-1984, a total of 85 General Pathologists successfully achieved certification by examination by the Royal College of Physicians & Surgeons of Canada. The Saskatchewan College of Physicians & Surgeons recognizes and accepts only Canadian qualifications.

The larger laboratories in Saskatoon and Regina will be able to attract candidates with sub-specialties in Pathology. General Pathologists for the other hospital laboratories may be difficult to recruit.

Numbers Of Successful Candidates
At The Specialty Examinations
Pathology: 1975-1984

SUB SPECIALTY	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ANATOMIC PATHOLOGY	22	28	25	22	21	28	28	30	22	27
GENERAL PATHOLOGY	14	8	5	13	8	11	8	6	5	7
HEMATOLOGICAL PATHOLOGY	3	6	3	2	4	1	3	4	3	6
MEDICAL BIOCHEMISTRY	3	5	2	4	3	5	2	4	7	0
MEDICAL MICROBIOLOGY	6	9	5	10	10	6	10	7	8	10
NEURO PATHOLOGY	2	0	1	2	1	5	2	2	1	1

Source: **Annual Report and Reference Handbook 1984. The Royal College of Physicians and Surgeons of Canada.**

To re-emphasize, Saskatchewan will require General Pathologists in their regional hospitals to replace those that leave or retire. At this time it appears that the Royal College of Physicians & Surgeons have on average only seven to eight new graduates for CANADA per year.

Recommendation 24: The present curriculum for the training of Certified Combined Technicians candidates should not be expanded.

The C.C.T. is trained to perform limited technician tests. For hospitals with very small laboratories and minimal radiology services, this is a valuable individual--capable of providing essential services in both the medical laboratory & radiology--albeit in a limited fashion.

As an hospital laboratory expands these individuals should receive additional training in specific areas. Their proficiency should be recognized by examination. These individuals can continue to provide technical services with ever increasing training. The demands will vary by hospital.

If the formal C.C.T. program is expanded, there is the real danger that the curriculum would soon approach that of the formal Canadian Technology Program. This would serve no useful purpose.

APPENDICES

LABORATORY SERVICES REVIEW

APPENDIX A

General Meeting - January 31, 1985
College of Medicine, University of Saskatchewan

NAME	REPRESENTING
Alan Ruetz	Saskatchewan Association of Health Service Executives
Keith Dalby	Saskatchewan Association of Health Service Executives/Saskatchewan Health-Care Association
Chuck Ames	Saskatchewan Hospital Services Plan, Regina
Stephen Harold	Saskatchewan Society of Clinical Chemists
Nobby Mambo	Saskatchewan Association of Pathologists
Edna S. Blum	Saskatchewan Society of Medical Laboratory Technologists
Henry J. Block	Director, Medical Arts Laboratory (Guest of Saskatchewan Association of Pathologists)
Ted Alport	Saskatchewan Association of Pathologists
Ron Walsh	Saskatchewan Society of Medical Laboratory Technologists
William L. Albritton	Head, Department of Microbiology, University of Saskatchewan
Douglas Rea	Saskatchewan Registered Nurses Association
Ian M. McDonald	Dean, College of Medicine
H. E. Emson	Professor and Head, Department of Pathology, College of Medicine and University Hospital, Saskatoon
D. Dexter	Pathologist, Plains Health Centre, Regina/College of Physicians and Surgeons, Saskatchewan
A. W. Thomson	Registrar, College of Physicians and Surgeons
J. C. Burt	President, College of Physicians and Surgeons
Ed Hobday	Saskatchewan Medical Association
E. H. Baergen	Saskatchewan Medical Association
Fergus Murphy	Saskatchewan Association of Pathologists
Dr. Frank J. Lone	Laboratory Services Review
David Warren	Laboratory Services Review, Saskatchewan Health

LABORATORY SERVICES REVIEW

HOSPITAL QUESTIONNAIRE

FEBRUARY, 1985

PART A

LABORATORY SERVICES QUESTIONNAIRE

Please respond to the following questions in a joint, signed letter from the (a) Chief Executive Officer, (b) Chief of Medical Staff and (c) Pathologist/ Director of Laboratories, or by means of individually-signed letters.

****

1. Laboratory Services

Are you generally satisfied with your present laboratory services? If not, what are your major areas of dissatisfaction?

Are there particular strengths or good features in current services that you believe should be noted?

2. Reliability of On-Site Test Results

Are you satisfied with the reliability of test results? Do they match your clinical judgements?

Can you estimate what percentage of work performed on-site is considered reliable by the medical staff? Please cite examples of unsatisfactory local tests.

3. On-Site Examinations

Are a sufficient number and variety of tests performed on-site in relation to your local needs?

If you would like to add more procedures, please name them in order of priority. Why should they be performed on-site (please bear in mind clinical necessity, the number and type of patients, the volumes required to maintain quality, etc.)?

Is the turn-around time adequate during the day? evening? night? weekends? Please cite unsatisfactory examples.

4. Referred-Out Work

Please name the laboratories to which you refer work, and the tests involved. Are you generally satisfied with the present arrangements? If not, why not?

How do you ship specimens to your referral laboratories? How do you receive test reports (mail, bus, telephone, courier, etc.)?

What are the average turn-around times on tests referred-out (from the time specimens leave the hospital until test reports are received)? Is the turn-around prompt enough for the findings to be meaningful? Please list the tests for which you believe the turn-around times are excessive. What should the times be for proper patient care? How might they be improved?

If you would rather refer some or all work to a different laboratory, which one(s) would you choose? What benefits would be gained?

If your hospital does not have a pathologist on staff, where is the closest pathologist-supervised laboratory (in terms of distance)? Is this the location of your referral laboratory?

If not, would you gain anything by referring all or certain tests to the nearest pathologist-supervised laboratory (for example, better reliability, turn-around, etc.)?

5. Provincial Laboratories

If you refer tests to the Provincial Laboratories in Regina, is the turn-around time satisfactory? What is the average turn-around time for various tests? If some or all turn-around times are unsatisfactory, what should the times be? How could they be improved?

LABORATORY SERVICES QUESTIONNAIRE

GUIDE TO PART B

AREA MEASUREMENTS

This section requests a reasonably accurate measure of the gross space occupied by the hospital, as a whole, and the laboratories during the last fiscal year. If the hospital is spread among several buildings, please provide the total for all of them.

The definition of "gross area" for departments is derived from "Area Measurement for Health Care Facilities" (CSA Standard CAN3-Z317.11-M82) and is repeated below:

> "4.3 Departmental Gross Area The departmental gross area shall be the total area assigned to the department without reduction for:
>
> (a) interior partitions and structural columns;
> (b) departmental circulation areas;
> (c) duct shafts and pipe spaces; and
> (d) mechanical, electrical or communication equipment rooms or access spaces contained within the department.
>
> 4.3.2 The general circulation area (e.g. corridors that separate different departments, elevator lobbies, elevator shafts, escalators and stairs) shall be measured in a manner similar to that for the measurement of departmental gross areas.
>
> 4.3.3 Where a partition separates two different departments, its areas shall be divided equally between them (see Figure 11).
>
> 4.3.4 The departmental gross area shall exclude the area of exterior walls."

PART B(1)

HOSPITAL NAME _____

LOCATION _____

LABORATORY SERVICES QUESTIONNAIRE

PLEASE PROVIDE THE NAMES OF THE FOLLOWING:

Chief Executive Officer or Administrator _____

Chief of Medical Staff _____

Director of Laboratories _____

Consulting Pathologist (If Applicable) _____

Senior Laboratory Technologist/Technician _____

PHYSICIANS CURRENTLY ON ACTIVE STAFF:

Number of Family Physicians _____

Number of Specialists
(By Specialty)

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

CURRENT LABORATORY STAFF:

Qualifications of Laboratory Director: _____

Qualification of Other Supervisory Personnel:

_____ _____

_____ _____

_____ _____

Number of Technologists, Technicians and Aids:

	Full-Time	Part-Time
A.R.T.	_____	_____
R.T.	_____	_____
C.C.T.	_____	_____
Other	_____	_____

PART B(2)

HOSPITAL NAME _____

LOCATION _____

LABORATORY SERVICES QUESTIONNAIRE

FACILITIES AND COSTS

AREA MEASUREMENTS (1983/84)	SQ. FEET	or	SQ. METERS
HOSPITAL - GROSS AREA	_____		_____
LABORATORIES - GROSS AREA	_____		_____

YEAR THE LABORATORY WAS BUILT? _____

YEAR OF LATEST "MAJOR RENOVATION" OF THE LABORATORIES (PLEASE BRIEFLY DESCRIBE EXTENT OF WORK) _____

_____

_____

_____

DOES THE LABORATORY HAVE:

BASIC NEGATIVE PRESSURE EXHAUST CABINET(S): YES ____ NO ____

NUMBER _____

BIOHAZARD OR LAMINAR FLOW EXHAUST CABINET(S): YES ____ NO ____

NUMBER _____

AIR CONDITIONING: CENTRAL ____ WINDOW ____ NONE ____

LABORATORY COSTS (1983/84)

GROSS SALARIES AND WAGES: $_____

SUPPLIES AND OTHER EXPENSES: $_____

DIRECT EQUIPMENT MAINTENANCE AND SERVICING CONTRACTS (IF NOT INCLUDED IN EXPENSES ABOVE): $_____

ANNUAL DEPRECIATION ON LABORATORY EQUIPMENT: $_____

ANNUAL DEPRECIATION ON LABORATORY FURNITURE, FIXTURES, ETC.: $_____

PART B(3)

HOSPITAL NAME _____

LOCATION _____

LABORATORY SERVICES QUESTIONNAIRE

AUTOMATED AND SEMI-AUTOMATED LABORATORY EQUIPMENT

TYPE	MAKE AND MODEL	YEAR PURCHASED	PURCHASE PRICE (OVER $500)	SERVICE CONTRACT? ($/YEAR)
HEMATOLOGY				
BIOCHEMISTRY				
OTHER				

(PLEASE ADD PAGES IF REQUIRED)

LABORATORY SERVICES QUESTIONNAIRE

GUIDE TO PART C

PART C - GENERAL

November has been selected as an "average volume" month in most hospitals. If you believe November was distinctly "not normal" in your hospital in any year, please note the fact and the reasons.

Please add pages if required; an additional sheet for Parts C(2), C(3) and C(4) is enclosed following Part C(4).

PART C(2) - BIOCHEMISTRY AND PART C(3) - HEMATOLOGY

TESTS is defined as the number of tests performed exclusive of repeats, standards, calibrations, controls, references, routine health examinations, environmental and research tests.

Please do not enter Statistics Canada Unit Values.

If you are using instrumentation that performs a "profile" or series of analyses on a single specimen, count each test in the profile individually. Please be sure to add the work done on other instruments to that listed for the profile.

Do not include mathematical calculations or manipulations as tests.

The following is a hypothetical example using part of a listing:

HEMATOLOGY	DAY 1	DAY 2	ETC.	MONTH END TOTAL NOV.
Hgb	100	103		
WBC	100	111		
RBC	100	100		
HCT	100	100		
Platelets	8	11		
ERS	67	73		
Differentials	67	73		
Etc.				

In the example above, Hbg, WBC, RBC and HCT are normally done as a profile. On Day 2, however, extra Hgb and WBC were performed on other equipment.

This instrument (for example, a Coulter S) may also calculate MCV, MCH and MCHC - do not list or count these as tests.

PART C(4) - MICROBIOLOGY

Please note that in this Part we are requesting the SPECIMEN count instead of tests.

PART C(5) - SUMMARY OF WORK PERFORMED IN HOSPITAL

In this Part, we wish to compare total levels of laboratory activity between November, 1984 and November, 1979 using three aggregate measures: total raw count, total Statistics Canada Unit Values and total accumulated paid hours.

The tables are basically organized the same as the Statistics Canada Annual Return of Health Care Facilities-Hospitals-Part One. Fill in the Standards Sections you normally do for StatCan. It is recognized that in the large majority of hospitals, for example, cardio-respiratory and nuclear medicine are not in the laboratory department.

RAW COUNT is defined as all tests used to derive the unit values reported in November of 1984 and 1979, including repeats, standards, calibrations, controls, references, routine health examinations, environmental and research tests.

Total Units and Total Accumulated Paid Hours are those as defined by Statistics Canada.

PART C(1)

HOSPITAL NAME _____

LOCATION _____

LABORATORY SERVICES QUESTIONNAIRE

Does your hospital use a "Routine Admission Profile"? Yes _____ No _____

If yes, please list the tests required:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

IN 1983/84:

BLOOD BANK

Grouping and Rh Performed: Yes _____ No _____

Cross-Matching Performed: Yes _____ No _____ If No, from where do you obtain blood? _____

_____

_____

Number of Patients Transfused: _____

Number of Bags Transfused: _____

_____

IN 1983/84:

HISTOLOGY Performed On-Site (Yes/No) _____ and/or Referred To _____

_____

CYTOLOGY Performed On-Site (Yes/No) _____ and/or Referred To _____

_____

AUTOPSIES Performed On-Site (Yes/No) _____ and/or Referred To _____

_____

_____

PART C(2)

HOSPITAL NAME _____

LOCATION _____

LABORATORY SERVICES QUESTIONNAIRE

TESTS* - NOVEMBER OF EACH YEAR

HEMATOLOGY - NUMBER OF EACH TEST PERFORMED	NOV. 1984	NOV. 1983	NOV. 1982	NOV. 1981	NOV. 1980	NOV. 1979
Subtotal From Added Pages						
TOTAL TESTS ON SITE						
In-Patients						
Out-Patients						
Referred-In						

TOTAL TESTS REFERRED-OUT						
In-Patients						
Out-Patients						

*PLEASE NOTE THE DEFINITION OF TESTS IN THE GUIDE.

PART C(3)

HOSPITAL NAME _____

LOCATION _____

LABORATORY SERVICES QUESTIONNAIRE

TESTS* - NOVEMBER OF EACH YEAR

CLINICAL CHEMISTRY - NO. OF EACH TEST PERFORMED	NOV. 1984	NOV. 1983	NOV. 1982	NOV. 1981	NOV. 1980	NOV. 1979
Subtotal From Added Pages						
TOTAL TESTS ON SITE						
In-Patients						
Out-Patients						
Referred-In						

TOTAL TESTS REFERRED-OUT						
In-Patients						
Out-Patients						

*PLEASE NOTE THE DEFINITION OF TESTS IN THE GUIDE.

PART C(4)

HOSPITAL NAME _____

LOCATION _____

LABORATORY SERVICES QUESTIONNAIRE

SPECIMENS - NOVEMBER OF EACH YEAR

MICROBIOLOGY - NO. OF SPECIMENS FOR TESTS	NOV. 1984	NOV. 1983	NOV. 1982	NOV. 1981	NOV. 1980	NOV. 1979
Urine Screen (Slides/ Agar Spoon)						
Urine Culture						
Sputum						
Stool						
C.S.F.						
Blood Cultures						
Swabs (Identify by Site if Possible)						
Subtotal From Added Pages						
TOTAL SPECIMENS						
In-Patients						
Out-Patients						
Referred-In						

TOTAL SPECIMENS REFERRED - OUT						
In-Patients						
Out-Patients						

MICROBIOLOGY PERFORMED IN HOSPITAL?	1983/1984 YES	1983/1984 NO	1978/1979 YES	1978/1979 NO
Gram Stain	_____	_____	_____	_____
Aerobic Cultures	_____	_____	_____	_____
Anaerobic Cultures	_____	_____	_____	_____
Sensitivities	_____	_____	_____	_____
Virology	_____	_____	_____	_____
Mycology	_____	_____	_____	_____
Parasitology	_____	_____	_____	_____

FOR ADDITIONAL PAGES, PLEASE COPY AND USE THIS FORM FOR PARTS C(2), C(3), C(4)

HOSPITAL NAME _____

LOCATION _____

LABORATORY SERVICES QUESTIONNAIRE

- NOVEMBER OF EACH YEAR

	NOV. 1984	NOV. 1983	NOV. 1982	NOV. 1981	NOV. 1980	NOV. 1979
Subtotal						

PART C(5)

HOSPITAL NAME _____

LOCATION _____

LABORATORY SERVICES QUESTIONNAIRE

SUMMARY OF WORK PERFORMED IN HOSPITAL

STANDARD SECTIONS	NOVEMBER 1984			NOVEMBER 1979		
	TOTAL RAW COUNT*	TOTAL STATCAN UNITS	TOTAL PAID HOURS	TOTAL RAW COUNT*	TOTAL STATCAN UNITS	TOTAL PAID HOURS
Procurement and Handling of Specimens						
Clinical Chemistry						
Hematology						
Blood Bank						
Surgical Pathology						
Autopsy Pathology						
Cytopathology						
Cardio-Respiratory						
Nuclear Medicine						
Microbiology						
Other: _____ _____						
TOTALS						

*PLEASE NOTE THE DEFINITION OF RAW COUNT IN THE GUIDE.

HOSPITAL QUESTIONNAIRE RESPONDENTS

APPENDIX C

Assiniboia Union
Balcarres Union
Biggar Union
Big River Union
Birch Hills Memorial Union
Borden Union
Broadview Union
Cabri Union
Canora Union
Carrot River Union
Central Butte Union
Coronach Union
Craik Community
Cudworth, St. Michael's
Cupar Union
Cut Knife Union
Davidson Union
Dinsmore Union
Dodsland Union
Eastend Union
Eatonia Union
Edam, Lady Minto Union
Esterhazy, St. Anthony's
Estevan, St. Joseph's General
Fillmore Union
Gainsborough Union
Goodsoil Union
Grenfell Union
Herbert-Morse Union
Hudson Bay Union
Humboldt, St. Elizabeth's
Ile a la Crosse, St. Joseph's
Imperial Union
Indian Head Union
Ituna Union
Kamsack Union
Kelvington Union
Kerrobert Union
Kincaid Union
Kipling Memorial Union
Kyle-White Bear Union
Lafleche Union
La Loche, St. Martin's
Lampman Union
Lanigan Union
La Ronge
Leader Union
Lestock, St. Joseph's Union
Midale Union
Montmartre Union
Moose Jaw, Providence
Moose Jaw Union
Moosomin Union
Neilburg and District Union
Nipawin Union
Nokomis Union
North Battleford, Battlefords Union
Pangman Union
Paradise Hill Union
Ponteix Union
Preeceville Union
Prince Albert, Holy Family
Prince Albert, Victoria Union
Prince Albert, Co-operative Health Centre
Rabbit Lake Union
Redvers Union
Regina General
Regina, South Saskatchewan Hospital Centre:
- Pasqua Hospital
- Plains Health Centre
- Wascana Hospital
Regina, Saskatchewan Cancer Foundation
Rosetown Union
Rose Valley Union
Rosthern Union
St. Walburg Union
Saskatoon City
Saskatoon, St. Paul's
Saskatoon, University
Saskatoon, Community Clinic
Shaunavon Union
Shellbrook Union
Smeaton Union
Spalding Union
Spiritwood Union
Swift Current Union
Tisdale Union
Turtleford, Riverside Memorial Union
Uranium City, Municipal
Wadena Union
Watson Union
Weyburn Union

Lloydminster
Loon Lake Union
Macklin, St. Joseph's
Mankota Union
Maple Creek Union
Meadow Lake Union
Melfort Union
Melville, St. Peter's
Whitewood-Moosomin Union
Wilkie Union
Wolseley Memorial Union
Wynyard Union
Yorkton Union

LITERATURE REVIEW - SELECTED ARTICLES

APPENDIX D

1. Biochemical Screening Tests, Effect of Panel Size on Medical Care.
G.D. Friedman et al (Permanente Research) Arch. Intern. Med. Vol 129 January 1972 p.91-97

2. Effective Utilization of Clinical Laboratories
J. Murphy J. Henry. Human Pathology Vol. 1978 p. 625-633

3. Public Sector Output Measurement Problems. The Case of the Hospital Clinical Laboratory.
David Anderson. Inquiry Vol. XIII March 1976 p. 71-79

4. Inflation Control in the Laboratory. Does Demand Equal Need?
M. Spencely. D.L. Miller Journal of Infection 1980.2 p.3-12

5. Factors Affecting Laboratory Utilization in Clinical Practice
M. Holmes et al Med. Decis. Making Vol.2 No.4 1982 p.471-482

6. Toward Optimal Laboratory Use Cost Containment and Changing Physicians Practice Behavior. Can The Fox Learn To Guard the Chicken Coop!
J. Eisenberg. S. Williams. JAMA. Nov. 13, 1981 Vol. 246 No.19 p.2195-2201

7. Laboratory Request Forms (Menus) That Guide and Teach
G. Lundberg. JAMA June 10, 1983 Vol. 249 No. 22 p.3075

8. Toward Optimal Laboratory Use. Ready! Aim! Fire! An Inquiry into Laboratory Test Ordering
E. Wong: T. Lincoln.
JAMA Nov. 11, 1983 Vol. 250 No. 18

9. Utility of Multiphasic Biochemical Screening and Systematic Laboratory Investigations
M. Werner: C. Altshuler. Clinical Chemistry Vol.25, No.4 1979 p.509-511

10. Laboratory Tests: Where Should They Be Performed
A.D. Farr Med. Lab. Sc. 1984. 41 p.97-98

11. Are Routine Measurements of Serum Chloride and Total Carbon Dioxide Levels Worth Doing?
A. Nanji; D. Blank CMA Jour. Apr. 15/82 Vol 126 p.901

12. Misuse of Laboratory Tests and Diagnostic Procedures
New.Eng.Med.Jour. Vol 307. 1982 p. 1336-1339

13. Modes of Compensation of Pathologists and The Charges For and Use of Laboratory Services
S. Markel. JAMA May 23-30. 1980 Vol. 243. No. 20 p.2053-2055

14. Should Diagnostic Testing Be Regulated
New.Eng.Jour.Med. Vol. 299 1978 p.947-949

15. Problems of Spectrum and Bias in Evaluating the Efficacy of Diagnostic Tests
D. Ransohoff; A. Feinstein. N.Eng.Jour.Med. Vol. 299 1978 p.926-930

16. Physician's Perception About Unnecessary Diagnostic Testing
S. Williams. Inquiry. 19:363-370 (Winter) 1982

17. The Physician's Role in the Cost-Containment Problem
S. Dresnick et al. JAMA. Apr. 13, 1979. Vol 241 No. 15 p.1606-1609

18. Costs of Diagnostic Tests: Estimates by health Professionals
W. Robertson. Medical Care. May 1980. Vol XVIII No. 5 p.556-559

19. From Professional Monopoly to Corporate Oligopoly. The Clinical Laboratory Industry in Transition
R. Baily Medical Care Feb. 1977 Vol XV No. 2 p.129-146

20. Physician Sensitivity to the Price of Diagnostic Tests
A United States and Canadian Analysis.
J. Hoey et al Medical Care Mar. 1982 Vol XX No. 3 p.302-307

21. Teaching Cost Effective Diagnostic Test - Use to Medical Students
S. Williams et al. Medical Care June 1984 Vol. 22 No. 6 p.535-542

22 Influence of Selective VS Panel Chemistry Tests on Cost and Diagnostic Time
C. Lehmann Am.Jour.Med.Tech. Vol 48 No. 10 Oct. 1982 p.833-836

23. Learning Diagnostic Restraint
D. Reuben New.Eng.Jour.Med. Vol 310 No. 9 Mar, 1984 p.591-593.

24. Assessing Cost Savings When Unnecessary Utilization of Laboratory Tests Can Be Abolished.
P. Winkel Amer.J.Clin.Path. Vol. 82 No. 4 Oct. 1984 p.418-423

25. Misuse of Laboratory Tests and Diagnostic Procedure
R. Sandstrom. New.Eng.J.Med. Vol 308 No. 17 Apr. 28, 1983 p.1035-36

26. Evaluating The Clinical Efficacy of Laboratory Tests
E. Robertson Amer.J.Clin.Path. Vol.79 Jan.1983 p.78-86

27. Structuring Complexity of Testing: A Process Orientated Approach to Limiting Unnecessary Laboratory Use.
D. Hardwick et al. Amer.J.Med.Tech. Vol. 48 No. 7 July 1982 p.605-608

28. Laboratory Testing in the Offices of Family Physicians
R. Qwyther et.al. Amer.J.Med.Tech. Vol48 No.8 Aug. 1982 p.697-702

29. Clinically Relevent Microbiology
P. Patterson. B.D. Hill - abstract from Saskatoon City Hospital. Person Communication.

30. Usefulness of microscopic Examination in Urinalysis
R. Bartlett. Amer.J.Clin.Path. Dec. 1984 Vol.82 No.6 p.713-716

31. Cost Containment and Labor Intensive Tests
M. Shapire et.al. JAMA July 13, 1984 Vol 252 No. 2 p.231-234

32. Processing Control and Cost in Bacteriology
R. Bartlett Am.S.Clin.Path. Vol 74 No. 3 Sept. 1980 p.287-296

33. The Microbiology Laboratory: Garbage In! Garbage Out!
C. Sanders: K. Aldridge. Clinical Microbiology Newsletter Vol5 No.18 Sept. 15, 1983

34. Making Optimum Use of the Microbiology Laboratory
R.C. Bartlett. JAMA Feb. 12, 1982 Vol.247 No.6 p.857-859

AUTHORS OF BRIEFS SUBMITTED TO THE LABORATORY SERVICES REVIEW

APPENDIX E

In order of receipt:

Dr. Derrick Dexter
Victoria Square Medical Clinic*
Medical Care Insurance Commission
Mr. Barry Hill
Ms. Susan E. Perron
Saskatchewan Blood Bank Committee*
Dr. M.E. Bailey
Dr. John M. Vetters
Saskatchewan Association of Clinical Chemists
Saskatchewan Medical Association
Mr. Tom Martin
Dr. Harry E. Emson
Dr. Edward C. Alport
Dr. Nobby C. Mambo
Saskatoon Community Health Unit*
College of Family Physicians (Saskatchewan Chapter)
Medical Arts Laboratory
Dr. Stephen Harold
Saskatchewan Society of Medical Laboratory Technologists
Dr. Henry J. Block
Regina Diagnostic Laboratories
College of Medicine
The Canadian Red Cross Society (Blood Transfusion Service)
Department of Regional Services*
Saskatchewan Government Employees' Union and Provincial Laboratories' Staff
Dr. Hugh E. Robertson
Chiropractors' Association of Saskatchewan*

* Meetings were arranged with all those who submitted Briefs with the exception of those noted with asterisks.

HOSPITALS VISITED

APPENDIX F

May 6	Balcarres Union Yorkton Union Canora Union
May 7	Preeceville Union Hudson Bay Union Melfort Union
May 8	Prince Albert: Holy Family : Victoria Union Birch Hills Union
May 9	Cudworth, St. Michael's Humboldt, St. Elizabeth's Wynyard Union
June 3	Swift Current Union Cabri Union
June 4	Maple Creek Union Ponteix Union Assiniboia Union
June 5	Regina, Pasqua
June 10	North Battleford Union Turtleford, Riverside Memorial
June 11	Macklin Union Kerrobert Union Rosetown Union
June 12	Saskatoon, City
June 17	Saskatoon, St. Paul's
June 18	Saskatoon, University
June 19	Moose Jaw: Union : Providence
June 25	Regina General
June 26	Plains Health Centre

PERFORMANCE OF HEMATOLOGY TESTS
BY THE MAJOR LABORATORY SECTORS

APPENDIX G(1)

TOTAL HEMATOLOGY

LABORATORIES	NOVEMBER 1979	% TOTAL NOV. 1979	NOVEMBER 1984	% TOTAL NOV. 1984	% CHANGE NOVEMBER 79 TO 84
HOSPITALS					
0 - 14.9	16,211	5.0	23,922	5.7	47.6
15 - 24.9	21,594	6.7	26,356	6.2	22.1
25 - 49.9	15,174	4.7	19,996	4.7	31.8
50 - 100	16,579	5.1	20,838	4.9	25.7
Regionals	39,533	12.2	49,122	11.6	24.3
Base	83,620	25.8	100,500	23.8	20.2
University	41,617	12.9	55,444	13.1	33.2
Sub-Total	234,328	72.4	296,178	70.2	26.4
PHYSICIANS OFFICES	45,549	14.1	64,427	15.3	41.4
PATHOLOGIST-SUPERVISED	43,776	13.5	61,539	14.6	40.6
PROVINCIAL LABORATORY	0	0	0	0	0
TOTAL	323,653	100.0	422,144	100.0	30.4

OUT-PATIENT HEMATOLOGY

HOSPITALS					
0 - 14.9	8,020	4.3	15,371	6.0	91.7
15 - 24.9	11,624	6.3	15,093	5.9	29.8
25 - 49.9	7,284	3.9	11,093	4.4	52.3
50 - 100	6,504	3.5	9,518	3.7	46.3
Regionals	15,064	8.1	19,982	7.8	32.6
Base	16,778	9.1	21,740	14.2	29.6
University	27,191	14.7	36,223	14.2	33.2
Sub-Total	95,611	51.7	129,020	50.6	34.9
PHYSICIANS OFFICES	45,549	24.6	64,427	25.3	41.4
PATHOLOGIST-SUPERVISED	43,766	23.7	61,539	24.1	40.6
PROVINCIAL LABORATORY	0	0	0	0	0
TOTAL	184,926	100.0	254,986	100.0	37.9

Sources: Hospital Questionnaire, MCIC, AR-1's, Provincial Laboratory

PERFORMANCE OF BIOCHEMISTRY TESTS BY THE MAJOR LABORATORY SECTORS

APPENDIX G(2)

TOTAL BIOCHEMISTRY

LABORATORIES	NOVEMBER 1979	% TOTAL NOV. 1979	NOVEMBER 1984	% TOTAL NOV. 1984	% CHANGE NOVEMBER 79 TO 84
HOSPITALS					
0 - 14.9	13,023	1.9	17,837	2.2	37.0
15 - 24.9	13,023	1.9	18,143	2.2	39.3
25 - 49.9	9,745	1.4	13,003	1.6	33.4
50 - 100	16,598	2.4	23,370	2.8	40.8
Regionals	66,061	9.4	87,293	10.5	32.1
Base	245,829	35.1	265,987	32.2	8.2
University	104,116	14.8	68,922	8.4	-33.8
Sub-Total	468,395	66.8	494,555	59.9	5.6
PHYSICIANS OFFICES	46,973	6.7	68,002	8.2	44.8
PATHOLOGIST-SUPERVISED	30,048	4.3	79,255	9.6	163.8
PROVINCIAL LABORATORY	156,071	22.3	183,714	22.3	17.7
TOTAL	701,487	100.0	825,526	100.0	17.7

OUT-PATIENT BIOCHEMISTRY

HOSPITALS					
0 - 14.9	7,479	2.1	10,393	2.2	40.0
15 - 24.9	6,942	2.1	10,056	2.2	44.9
25 - 49.9	3,851	1.2	6,078	1.3	57.8
50 - 100	5,950	1.8	10,358	2.2	74.1
Regionals	20,960	6.2	31,364	6.8	49.6
Base	29,268	8.5	36,100	7.9	23.3
University	32,068	9.4	21,986	4.8	-31.4
Sub-Total	106,518	31.4	126,335	27.6	18.6
PHYSICIANS OFFICES	46,973	13.8	68,002	14.9	44.8
PATHOLOGIST-SUPERVISED	30,048	8.8	79,255	17.3	163.8
PROVINCIAL LABORATORY	156,071	46.0	183,714	40.2	17.7
TOTAL	339,610	100.0	457,306	100.0	34.7

Sources: Hospital Questionnaire, MCIC, AR-1's, Provincial Laboratory

PERFORMANCE OF MICROBIOLOGY PROCEDURES IN HOSPITALS APPENDIX G(3)

HOSPITAL GROUPS	NOVEMBER 1979			NOVEMBER 1984		
	TOTAL	INPATIENT	OUTPATIENT	TOTAL	INPATIENT	OUTPATIENT
0 - 9.9	0	0	0	0	0	0
10 - 14.9	0	0	0	0	0	0
15 - 19.9	0	0	0	0	0	0
20 - 24.9	0	0	0	0	0	0
25 - 34.9	267	88	179	1,194	349	539
35 - 49.9	39	9	30	347	88	259
50 - 100	1,366	653	503	1,954	843	752
Regionals	8,164	4,122	2,836	11,527	5,384	3,617
Base	14,834	11,671	2,932	17,560	13,862	3,551
University	3,938	2,822	663	5,658	3,254	1,113
TOTAL	28,608	19,365	7,143	38,240	23,780	9,831

Source: Hospital Questionnaire

PRIVATE LABORATORIES IN SASKATCHEWAN

SUMMARY OF SERVICES AND PAYMENTS

APPENDIX G(4)

HOSPITAL GROUPS	VOLUMES OF TESTS, SERVICES			PAYMENTS FOR TESTS, SERVICES		
	1978	1983/84	% CHANGE	1978	1983/84	% CHANGE
PATHOLOGIST-SUPERVISED LABORATORIES						
Biochemistry	402,278	658,251	63.6	841,299	2,416,934	187.3
Blood Bank	2,448	3,718	51.9	8,646	24,604	184.6
Hematology	611,991	657,306	7.4	576,262	1,079,343	87.3
Microbiology	83,810	102,629	22.5	180,208	905,575	402.5
Serology	19,362	24,134	24.6	40,120	151,316	277.2
Specimen C & R	56,871	123,265	116.7	56,280	221,739	294.0
TOTAL	1,176,760	1,569,302	33.4	1,702,815	4,799,513	181.9
PHYSICIANS' OFFICE LABORATORIES						
Biochemistry	536,924	723,521	34.8	560,517	2,077,278	270.6
Hematology	485,309	712,927	46.9	466,261	1,773,842	280.4
Microbiology	12,472	31,228	150.4	10,593	104,315	884.8
Specimen C & R	130,338	149,369	14.6	221,793	451,151	103.4
TOTAL	1,165,043	1,617,045	38.8	1,259,164	4,406,585	250.0

Source: MCIC

HOSPITALS: TESTS REQUESTED ON SPECIMENS REFERRED-OUT

APPENDIX G(5)

1978/79

CHEMISTRY

A.D.C.	INPATIENT	OUTPATIENT	TOTAL	TO PROV. LABS
0 - 9.9	65,622	124,573	190,195	183,476
10 - 14.9	64,466	103,770	168,236	155,163
15 - 19.9	85,251	107,190	192,441	177,261
20 - 24.9	51,751	69,987	121,738	106,868
25 - 34.9	37,974	57,964	95,938	62,572
35 - 49.9	10,344	47,107	57,451	57,418
50 - 100	35,520	31,847	67,367	67,310
Regionals	68,921	63,041	131,962	34,919
Base	54,840	17,143	71,983	36,803
University	1,236	3,533	4,769	1,973
TOTAL	475,925	626,155	1,102,080	883,763

HEMATOLOGY

A.D.C.	INPATIENT	OUTPATIENT	TOTAL	TO PROV. LABS
0 - 9.9	5,373	17,220	22,593	15,776
10 - 14.9	977	1,907	2,884	267
15 - 19.9	946	552	1,498	163
20 - 24.9	408	1,238	1,646	37
25 - 34.9	796	3,361	4,157	0
35 - 49.9	6	11	17	7
50 - 100	90	18	108	14
Regionals	26,089	6,940	33,029	469
Base	1,631	1,372	3,003	1,228
University	1,080	728	1,808	1,808
TOTAL	37,396	33,347	70,743	19,769

MICROBIOLOGY

A.D.C.	INPATIENT	OUTPATIENT	TOTAL	TO PROV. LABS
0 - 9.9	5,564	11,281	16,845	12,796
10 - 14.9	7,224	8,295	15,519	11,544
15 - 19.9	6,620	6,996	13,616	11,730
20 - 24.9	3,467	3,553	7,020	7,017
25 - 34.9	4,872	3,116	7,988	5,332
35 - 49.9	2,061	4,536	6,597	6,401
50 - 100	2,968	1,714	4,682	4,523
Regionals	10,900	6,705	17,605	8,284
Base	4,032	620	4,652	3,021
University	1,194	471	1,665	419
TOTAL	48,902	47,287	96,189	71,067
GRAND TOTAL*	592,883	731,123	1,324,006	991,905

Source: AR-1's

* Grand Total includes sections not itemized above.

HOSPITALS: TESTS REQUESTED ON SPECIMENS REFERRED-OUT

1983/84

CHEMISTRY

A.D.C.	INPATIENT	OUTPATIENT	TOTAL	TO PROV. LABS
0 - 9.9	75,258	173,041	248,299	245,682
10 - 14.9	97,543	176,357	273,900	272,270
15 - 19.9	103,850	187,313	291,163	274,358
20 - 24.9	86,141	128,297	214,438	214,438
25 - 34.9	29,161	66,465	95,626	73,089
35 - 49.9	18,518	93,935	112,453	112,453
50 - 100	25,628	27,418	53,046	52,845
Regionals	50,944	50,648	101,610	52,524
Base	49,269	25,605	74,874	46,358
University	1,692	3,012	4,704	3,003
TOTAL	538,004	932,091	1,470,095	1,337,020

HEMATOLOGY

A.D.C.	INPATIENT	OUTPATIENT	TOTAL	TO PROV. LABS
0 - 9.9	970	2,397	3,367	1,950
10 - 14.9	496	1,327	1,823	508
15 - 19.9	1,073	2,218	3,291	46
20 - 24.9	16	60	76	6
25 - 34.9	299	1,593	1,892	4
35 - 49.9	6	6	12	0
50 - 100	71	61	132	2
Regionals	45,363	16,197	61,560	720
Base	4,300	4,810	9,110	4,403
University	1,183	875	2,058	2,054
TOTAL	53,777	29,544	83,321	9,693

MICROBIOLOGY

A.D.C.	INPATIENT	OUTPATIENT	TOTAL	TO PROV. LABS
0 - 9.9	5,498	12,522	18,020	17,893
10 - 14.9	9,854	12,550	22,404	19,360
15 - 19.9	11,370	10,740	22,110	15,982
20 - 24.9	4,229	7,007	11,236	11,236
25 - 34.9	2,407	2,759	5,166	3,000
35 - 49.9	2,398	4,113	6,511	6,511
50 - 100	2,710	2,451	5,161	5,067
Regionals	13,979	11,099	25,078	13,759
Base	12,414	2,962	15,376	10,585
University	692	311	1,003	65
TOTAL	65,551	66,514	132,065	103,458
GRAND TOTAL*	690,198	1,053,197	1,743,375	1,445,948

Source: AR-1's

* Grand Total includes sections not itemized above.

ESTIMATED TOTAL COST OF LABORATORY SERVICES IN ALL SASKATCHEWAN GENERAL HOSPITALS

APPENDIX H(1)

DIRECT OPERATING COSTS		
Salaries: Medical	$ 2,767,850	6.5%
Other	20,232,682	47.9
Supplies and Other Expenses	5,540,217	13.1
Equipment Services Contracts	427,077	1.0
SUB-TOTAL	$28,967,826	68.5%
APPORTIONED OPERATING OVERHEAD		
Hospital Administration (Salaries, Supplies, Expenses)	$ 1,812,744	4.3%
Housekeeping, Plant Operation, Plant Maintenance	1,966,572	4.7
Employee Benefits	2,061,251	4.9
SUB-TOTAL	$ 5,840,567	13.8%
FIXED OVERHEADS		
Building Space	$ 4,644,599	11.0%
Furniture, etc.	820,025	1.9
Major Laboratory Equipment	1,160,031	2.7
SUB-TOTAL	$ 6,624,655	15.7%
OTHER EXPENSES	$ 828,651	2.0%
TOTAL	$42,261,199	100.00%

NOTES REGARDING METHODOLOGY

Salaries: Medical

Source: AR-1's, F.Y. 1983/84. Medical salaries reported for non-pathologist supervised laboratories were deleted as they represent payments for radiology services. Payments to University Hospital by the Clinical Services Fund were added.

Salaries: Other

As reported in the AR-1's.

Supplies and Other Expenses

As reported in the AR-1's.

Equipment Services Contracts

Estimated from the Hospital Questionnaires. It is recognized that at least some hospitals will have reported this item under Plant Maintenance or other expense categories. For some hospitals, however, equipment servicing contracts exceeded the amount reported for all equipment maintenance. Since it is only a potentially minor distortion, and illustrates the high cost of maintenance, it was included separately.

Hospital Administration

Administration salaries, supplies and expenses as reported in the AR-1's were apportioned to the laboratories on the basis of the proportion of "accumulated paid hours" reported by the laboratories compared to the hospitals as a whole.

Housekeeping, Plant Operation, Plant Maintenance

Source: AR-1's. These were apportioned to the laboratories on the basis of their proportion of gross floor space in the hospitals, as reported in the Hospital Questionnaire.

Employee Benefits

Source: AR-1's. Apportioned to the laboratories on the basis of their reported total salaries as a proportion of total hospital salaries.

Building Space

Source: Hospital Questionnaire. Based on the floor space reported by the hospitals. Hanscomb Consultants, Inc., estimated the building gross space apportionable to the laboratories based on three different types of construction. The replacement cost was estimated at October, 1983. The annual cost of the laboratory space was expressed by spreading the costs over 20 years, assuming "uniform capital recovery" and an interest rate of 12%.

Furniture, etc.

Assumed as 15% of the capital cost (derived from numerous laboratory construction records and estimates), and depreciated over ten years at a 12% cost of capital.

Major Laboratory Equipment

Source: Hospital Questionnaire. All equipment purchased in 1978 or later was depreciated on the basis of a seven year life; the undepreciated portion was recovered over its remaining "life" at a cost of capital of 12%.

Other Expenses

Certain other "expenses" are not captured in hospital reports. These include federal sales taxes, second or third apportionments of hospital expenses like administration, and plant operation, and laundry and linen services. A review of various sources indicated these averaged slightly under 2% of the total expenses.

Note: The above costs were derived for each of the nine hospital A.D.C. categories plus University Hospital and totalled.

Costing of the Provincial Laboratory's clinical diagnostic services was done using a similar methodology. Additional overheads were applied to cover services provided by Saskatchewan Health.

GROWTH OF LABORATORY COSTS COMPARED TO OTHER HEALTH SERVICES

APPENDIX H(2)

HOSPITALS

HOSPITAL SERVICES	1978/79 to 1983/84 PERCENT REAL GROWTH OF COSTS*		
	NON-MEDICAL SALARIES	SUPPLIES AND OTHER EXPENSES	TOTAL DIRECT EXPENSES
Laboratory	40.8%	42.0%	41.0%
Radiology	23.3%	30.0%	25.0%
Total Diagnostic Services	38.3%	31.8%	35.1%
Total Hospital Operating Expenses	30.7%	13.4%	29.4%

Source: AR-1's, FY 1978/79 and FY 1983/84
* 1983/84 costs were deflated to 1978/79 dollars.

GROWTH IN PAYMENTS BY TYPE OF SERVICE
TO PRIVATE PRACTITIONERS 1978/79 to 1983/84

	NOMINAL GROWTH	REAL GROWTH
Pathologist Labs	192.4%	80.8%
Physician Office Labs	250.0%	125.4%
Consultations	104.2%	31.5%
Diagnostic Radiology	106.5%	33.0%
Other Diagnostic Procedures	164.1%	70.1%
All Services	118.7%	40.9%

Source: MCIC

RUN-OFF COSTS FOR R.G.H. SMAC

On six days between 23rd and 30th July, 1985, the General Hospital received 2,282 samples from the Provincial Laboratories because their SMAC was inoperable. The cost of running these samples was calculated to determine whether our previous estimate of $0.16 (no additional staff time) and $1.79 (additional staff time required) were accurate.

The details are as follows:

		Cost/Profile
Overtime		
Technical	54 hr @ $25.72 = $849.00	
Clerical	10 hr @ $10.00 = $100.00	
Total	$949	$0.42
Additional Reagents		
for 43.5 extra hours SMAC time		
43.5 x 60 x 0.42 = $1,096.00		$0.48
Additional Consumables		
Report form		$0.05
Sample cup		$0.04
Controls		$0.05
TOTAL		$1.04

On a regular basis overtime would be reduced because of better organization. It is considered that a 50% reduction in overtime could be achieved. This would reduce the cost per profile to $0.80.

It can therefore be concluded that our 1984 estimates were high - probably due to underestimating the number of additional samples which can be run during the working day without overtime. A figure of 150 - 200 additional samples could be run daily for about $0.20 per sample.

J.M. Vetters, M.D.
Director of Laboratories

SASKATCHEWAN QUALITY ASSURANCE SERVICE

- PROPOSAL -

Premise:

1. All clinical laboratories in Saskatchewan shall partake in the program.
2. One comprehensive program to include the major disciplines.
3. College of American Pathologists (CAP) Interlaboratory Comparison Program shall be utilized for largest data base.
4. Copies of all survey reports to Committee of Professional Consultants via the Secretariat.
5. Team of professionals appointed as a peer review committee.

Discussion (see diagram)

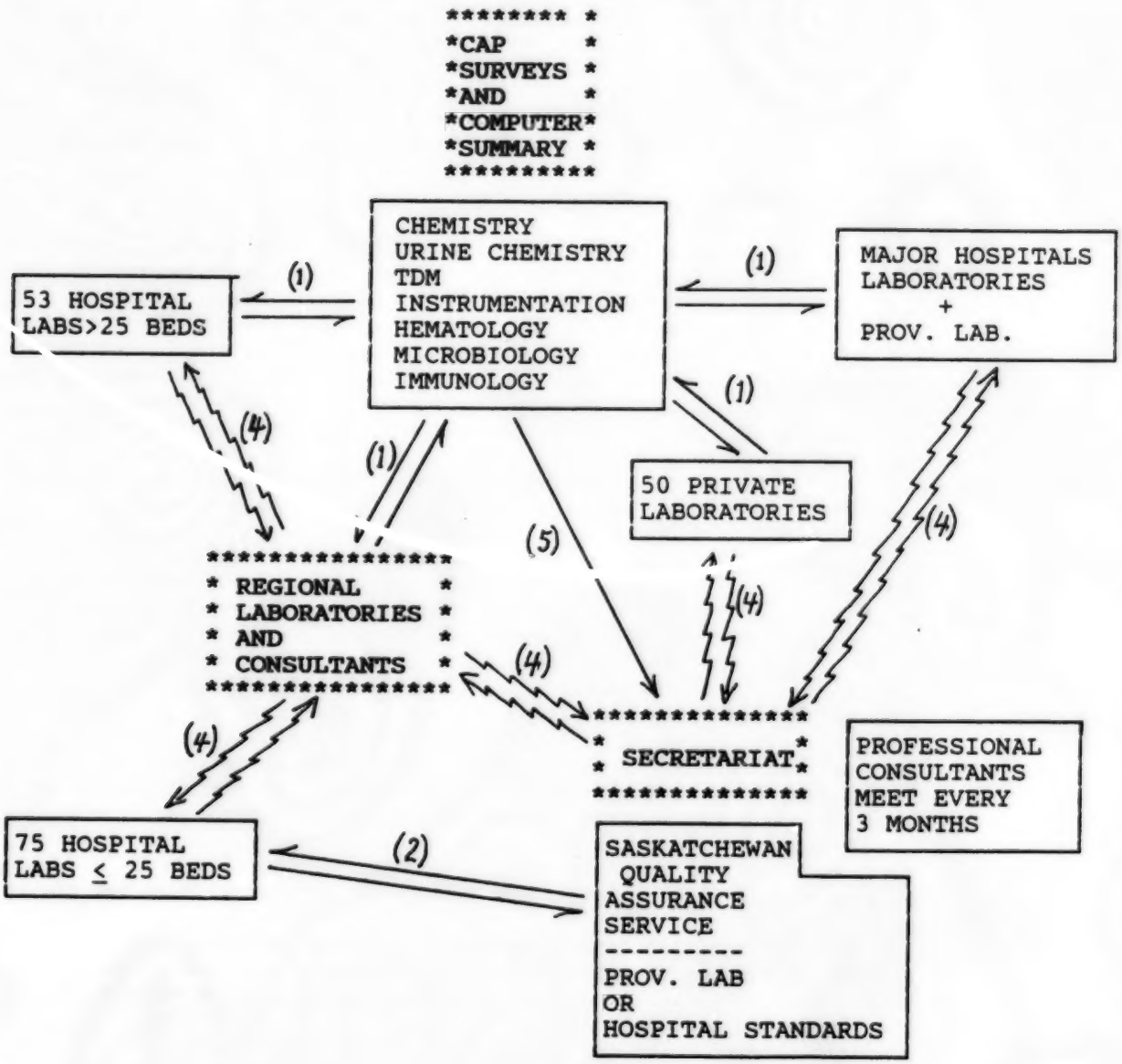
The CAP sends appropriate survey materials to all laboratories except those hospitals with 25 beds or less. The Saskatchewan Quality Assurance Service (SQAS) through the Regional Consultants (senior technologists) shall provide guidance for the selection of the appropriate program(s). The regional consultants shall also help rural hospital laboratories to properly classify their test methods for the CAP. Results of computer data analysis will be forwarded to each subscribing laboratory by the CAP and duplicate reports to the Secretariat of the SQAS.

The professional consultants will meet every 3 months following quarterly mailings by the CAP. Duplicate reports will have been forwarded by the Secretariat to the appropriate consultants prior to each meeting. It is not recommended that written comments alone be returned to the Secretariat since a laboratory may have problems in more than one discipline suggesting basic management problems that need to be addressed by the committee. There may also be information feedback from the regional consultants to be considered. The Secretariat of the SQAS will act as the data nerve center. Information and reports received will be re-addressed to the appropriate professional consultant. The professional consultants will maintain standards through peer review. Existing staff of the Secretariat (Provincial Laboratories or Hospital Standards) should be able to absorb the necessary additional clerical duties.

Private laboratories will be required to report results of all tests performed in their laboratory that are on their survey program(s). Failure to do so may jeopardize payment by MCIC for the tests affected.

The provincial laboratories would purchase, prepare, and distribute samples to approximately 75 hospitals with less than 25 beds. The provincial laboratories would also send these samples to the larger hospital laboratories whose role is to add to the comparative data. The quality control samples should analyze material from commercial sources. The data obtained is fed into a small computer for more rapid data handling and correlation, e.g. IBM PC with printer (approximately $5,000.00). Results are reviewed by the Professional Consultants.

SASKATCHEWAN QUALITY ASSURANCE SERVICE



1) Separate subscriptions to appropriate CAP program(s).
2) Hospitals less than 25 beds can best be served as at present by the Provincial Laboratories PAS program with possible modifications.
3) Copies of all surveys forwarded to subscribers should go to the central agency.
4) Communication/consultation.
5) Copies of all evaluation reports.

COMMITTEE OF PROFESSIONAL CONSULTANTS

The committee shall consist of appointees from the various provincial professional organizations. Where no provincial organization exists, then the national organization would be contacted.

Composition of the Committee:

Two clinical chemists (Saskatchewan Society of Clinical Chemists)
One clinical hematologist
One clinical microbiologist
One pathologist (Saskatchewan Association of Pathologists)
One medical laboratory technologist (Saskatchewan Society of Medical Laboratory Technologists)
One physician (Saskatchewan College of Physicians and Surgeons)

Terms of Reference:

1. Shall meet every 3 months.
2. Shall review all statistical data from all laboratories
3. Shall communicate with the laboratory via the Secretariat when necessary.
4. Shall have power to recommend a laboratory to discontinue a test or tests if proficiency cannot be maintained.

EDUCATION

AT PRESENT

1. A program exists involving regional consultants that conduct seminars periodically in five regional areas. A small percentage of the consultants' time is devoted to education, materials purchasing, assistance with group purchasing plans and quality control monitoring.
2. Up to two meetings a year of all regional consultants with Mr. C.F. Ames.
3. No discourse with private laboratories.

PROPOSED FOR HOSPITAL-BASED LABORATORIES

1. Increased help to Regions (perhaps on a part-time basis) to free consultants to devote 50% of their time for consultant duty.

OR

More consultants to reduce the number of rural hospital laboratories that each consultant would be responsible for.

2. Regional assistance in accurately identifying method and instrument for all rural hospital laboratories to ensure accurate classification for more accurate comparative statistics in the CAP survey.

3. Specific job description for regional consultants.

4. Consultants should provide wavelength and photometric calibration solutions to rural hospital laboratories for photometer checks. (This should also be a function of the more limited provincial laboratories program).

Recommendations for Private Pathologist or Physician Supervised Laboratories

Laboratories that exhibit quality control difficulties and wish to receive help, an avenue of communication should remain open to the peer group through the Secretariat. If on-site consultation is required and provided, costs so generated would be charged to the physician or private laboratory.

Advantages of the Scheme

1. Review by peers
2. Very large data base of the CAP program affords better interpretation of comparative data.
3. One scheme for quality control in several disciplines.
4. Computer program and processing included in the CAP package.
5. Professional peer group would ensure appropriate quality of laboratory service is maintained.
6. One part-time quality control technologist required, if furnished with small computer (e.g. IBM PC)
7. Central agency provides a permanent address.

A Saskatchewan only data base program would have the following important deficiencies:

(a) Lack of adequate data base thus no meaningful comparative data.
(b) Computer purchase, programing and staffing could generate significant central costs.

Stephen Harold, Ph.D.
President, Saskatchewan Society of Clinical Chemists
Department of Pathology
Regina General Hospital

APPENDIX K(1)

VICTORIA UNION HOSPITAL
1200 - 24th STREET WEST
PRINCE ALBERT, SASKATCHEWAN S6V 5T4
PH (306) 764-1551

LABORATORY
May 14, 1985

Mr. D. Warren
Saskatchewan Health
3475 Albert Street
Regina, Saskatchewan
S4S 6X6

Dear Mr. Warren:

I phoned the Post Office, Jet Courier, and the Bus Depot; listed below are the times for various pick ups and deliveries:

POST OFFICE (note: These are fairly recent schedules because of the new sorting centre.)

NAME OF TOWN	TIME SPECIMEN TO BE MAILED	TIME OF DELIVERIES TO P.A.
Kinistino	4:00 p.m.	6:55 p.m.
Birch Hills	4:35 p.m.	6:55 p.m.
Shellbrook	4:50 p.m.	
Spiritwood	3:30 p.m.	6:30 p.m.
Leoville	3:00 p.m.	
Big River	2:00 p.m.	5:15 p.m.
La Ronge	1:30 p.m.	6:30 p.m.
Wakaw	4:10 p.m.	4:30 a.m.
Cudworth	4:30 p.m.	(see bus route)
Rosthern	5:25 p.m.	

JET COURIER (This is currently Jet Courier regular runs)

NAME OF TOWN	TIME SPECIMEN TO BE MAILED	TIME OF DELIVERIES TO P.A.
Rosthern	5:00 p.m.	7:00 p.m.
Melfort Tisdale Nipawin	Some time in the afternoon	Arrives in P.A. at 5:00 p.m. ($5.50/stop)

(these hospitals could send special Chemistry & Micro)

BUS ROUTES

NAME OF TOWN	TIME SPECIMEN TO BE MAILED	TIME OF DELIVERIES TO P.A.
Kinistino	8:58/1:48	10:30/2:40
Birch Hills	9:30/2:15	10:30/2:40
Shellbrook	7:15 p.m.	8:30 p.m.
Spiritwood	9:20 a.m.	12:00 a.m.
Leoville	8:45 a.m.	12:00 a.m.
Big River	9:25 a.m.	12:00 a.m.
La Ronge	8:35 a.m.	12:30 p.m.
Wakaw	7:30 p.m.	8:40 p.m.
Cudworth	7:00 p.m.	8:40 p.m.
Rosthern	7:00 p.m.	8:20 p.m.
Nipawin	5:30 p.m.	
Arborfield	5:00 p.m.	8:20 p.m.
Smeaton	6:00 p.m.	

The Post Office, Bus and Jet Courier said that we could make arrangements for specimen pick up.

In reviewing the times, some either by Bus, Post Office, or Courier, all specimens could be in Prince Albert by no later than 8:40 p.m. and to the Lab by about 9:00 p.m.

If we scheduled Microbiology and Clinical Chemistry on the night shift starting the planting and analyzing, the Chemistry work would be out in time for the morning mail and emergency values phoned.

Hope that this is of some help.

Submitted by,

Fred Bahr, R.T., A.R.T.
Director of Medical Technology

FB:smm
cc: Mr. Stefanuk

APPENDIX K(2)

Swift Current Union Hospital

499 - 4th Avenue N. E., Swift Current, Saskatchewan S9H 2K1
Telephone (306) 773-2851

GORDON A. ALLSEN
Executive Director

June 14, 1985

Mr. David Warren
Saskatchewan Health Care Commission
Regina, Saskatchewan

Dear Mr. Warren:

In response to your request to investigate the transportation of specimens from smaller hospitals to Swift Current, I have found the following information.

1. Most couriers and private trucking companies would not be an acceptable method since they do not make daily runs to these communities but rather go only once or twice per week.

2. Mail originating from Leader, Cabri, Maple Creek, Gull Lake, Kyle, Shaunavon, Eastend, Climax, Vanguard, and Ponteix is sorted in Swift Current and the Postmaster ensures next day delivery on all mail posted before the local postal deadlines. He also said same day delivery could be made if shipped "Special Delivery" and these specimens would be delivered about 6:00 P.M.

3. Mail originating from Herbert, Kincaid and Mankota would be routed to Moose Jaw for sorting and then sent back to Swift Current or to Regina. There would be a possibility of a one day delay however the Postmaster indicated that usually there would be next day delivery.

4. Mail originating from Eatonia, Eston, Elrose, Dinsmore, Lucky Lake, and Beechy is routed to Saskatoon then to Moose Jaw and finally back to Swift Current or Regina. The Postmaster indicated this would result in a 24 hour delay in obtaining specimens.

5. Bus service is very good for Maple Creek, Gull Lake or Herbert since these communities receive 3 to 4 buses per day.

6. Daily bus service is available from Elrose, Kyle, Leader and Cabri.

7. Bus service is available from Mankota and Kincaid Tues. - Sat.

8. Bus service is available from Shaunavon, Climax and Eastend Monday, Tuesday, Thursday and Friday

. . .2

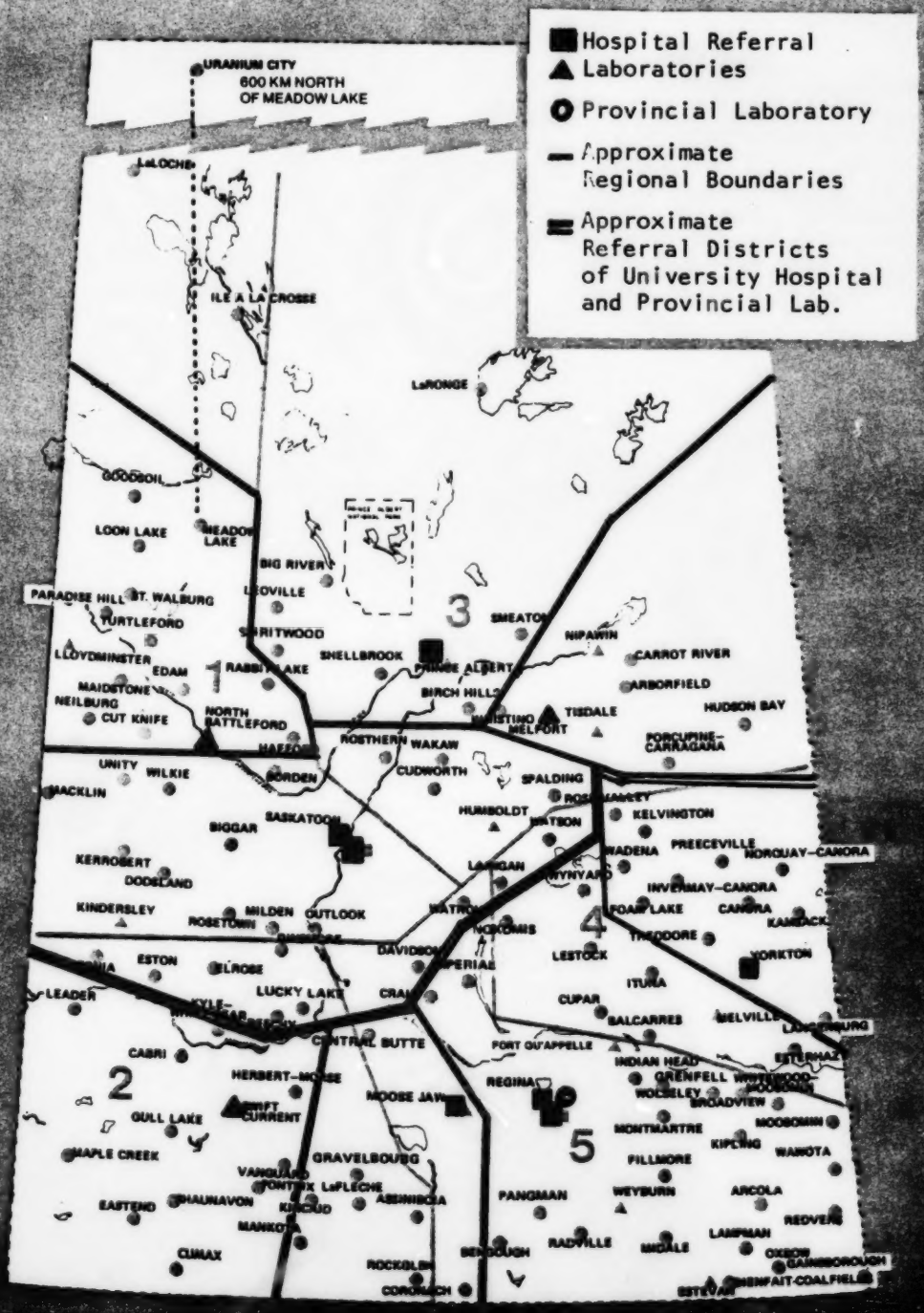
It would appear that mail service is the best route in all but a few exceptions and for all communities service should be at least as fast as that obtained in Regina.

I hope that this is the information that you requested.

Yours Sincerely,

Gerry Dempsey
Director of Laboratories

GD/bh

General Hospitals in Operation at March 31, 1984

APPROXIMATE HOSPITAL-BASED REFERRAL LABORATORY "REGIONS"